PAM1360E
PAM960E
PAM560E
PAM360E

SERVICE MANUAL

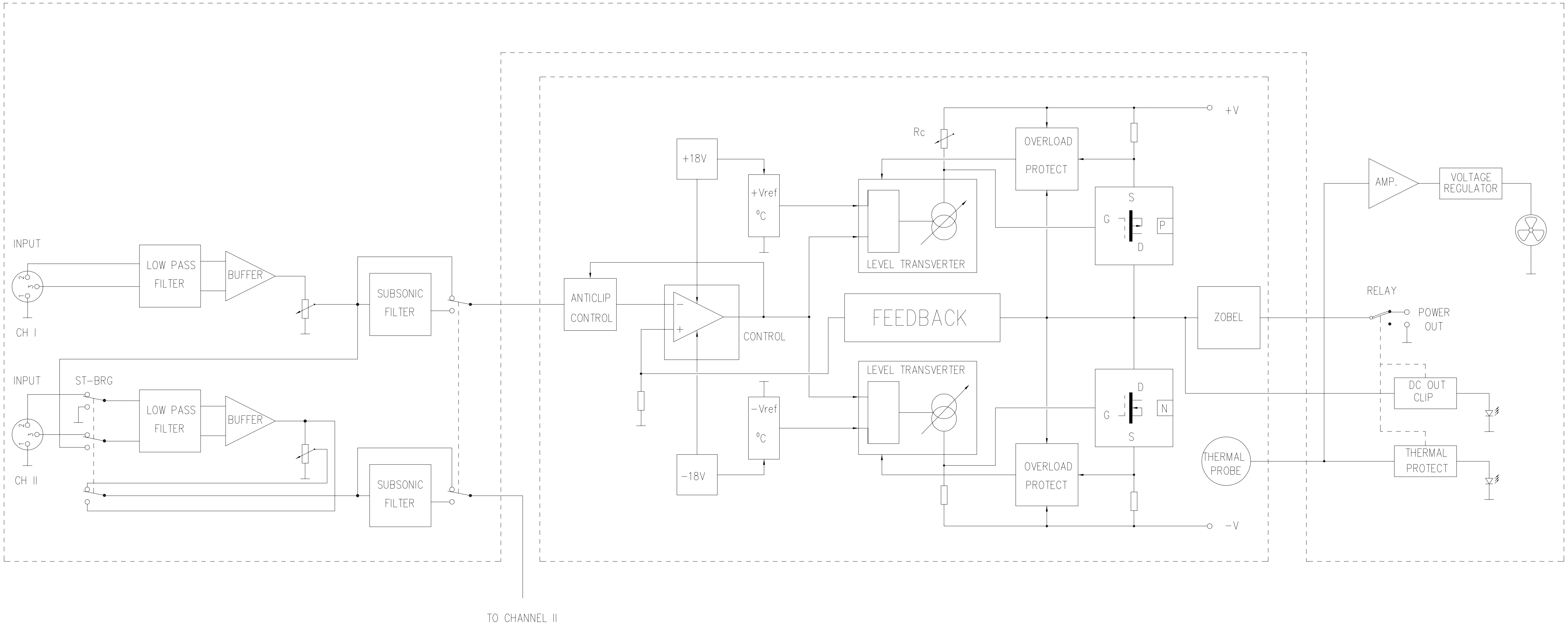


ECLER

AUDIO CREATIVE POWER

SERVICE MANUAL PAM1360E/960E/560E/360E

INDEX



TITLE: BLOCK DIAGRAM	MODEL: PAM1360	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA	
	SHEET 1 OF 1		
DRAWN: J.QUERALT / DATE: 15.01.98	REPLACES: 07.05.97	DRW. NO. 10.0430	REV.
CHECKED: / DATE:	REPLACED BY:		

MODULE CTO 11.0651 OPERATION - DESCRIPTION

The control element is the operational NE5534. This is a very low noise operational, especially designed for very high quality applications in professional audio equipment, control equipment and telephony channel amplifiers.

The operational is internally compensated for a gain equal to or higher than three. Frequency response can be optimized with an external compensation capacity, for several applications (unity gain amplifier, capacitive load, slew-rate, low overshoot, etc...).

Characteristics:

Small-signal bandwidth: 10Mhz
Output drive capability: 600Ω 10V(rms) at Vs=±18V
Input noise voltage: 4nV/√Hz
DC voltage gain: 100000
AC voltage gain: 6000 at 10KHz
Power bandwidth: 200kHz
Slew-rate: 13V/µs
Supply voltage range: ±3 to ±20V

POWER SUPPLY

The BF871 and BF872 transistors are mounted in a common base configuration, in a current source structure. The current sources have a double function: polarizing the gate-source links in the MOSFETs to the limit of the conduction and moving the voltage variations at the operational output which are refered to ground to voltage variations refered to high voltage power supply. The polarization point is calculated so the voltage dropout in Rc(R119+R120) is the limit voltage of conduction of the MOSFETs (≈2 to 3V), enough to carry the bias current. If we modulate in AC the base-emitter voltage, the Ic and VRc will vary proportionally. In our configuration, as the reference voltage Vref is constant (it is a part of the operational power supply), we add the operational output voltage to the transistors emitter through Re (R121-R122).

The Rc value fixes the source output impedance. We do not recommend to raise it higher than 1KΩ because of frequency response and slew rate reasons. This voltage circuit's gain is, as usual in a common base configuration with Rc/Re emitter resistor, 0.45.

POWER SOURCE STRUCTURE

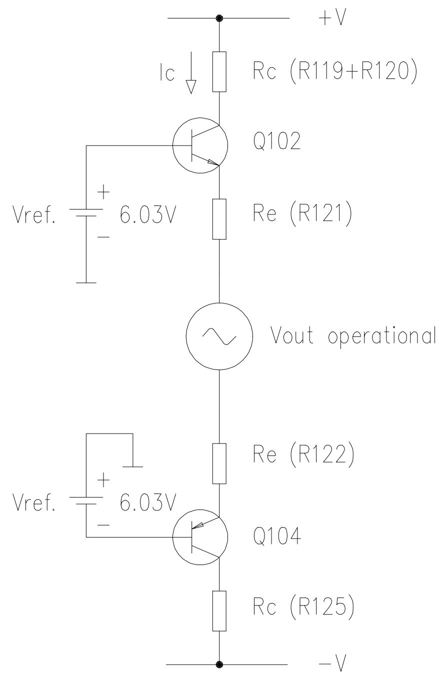


fig. 1

BIAS CURRENT ADJUST

The bias current adjust is performed through the variable resistor connected between the emitters of the current sources R124 (5KΩ). It delivers a supplementary current (it does not go through the operational) which simultaneously increases the voltage which falls in the Rc load resistors.

This is the easiest way of acting with just one adjust over both branches at the same time. In order to adjust the bias current the adjustable resistor must be varied untill a current of about 70mA circulates through each MOSFET. So, for instance, for a PAM960E in which there are five MOSFETs it will be 70 x 5 = 350mA.The bias current depends on the MOSFETs temperature and the stabilizing circuit transistors temperature.

POWER SOURCE STRUCTURE AND BIAS CURRENT ADJUST

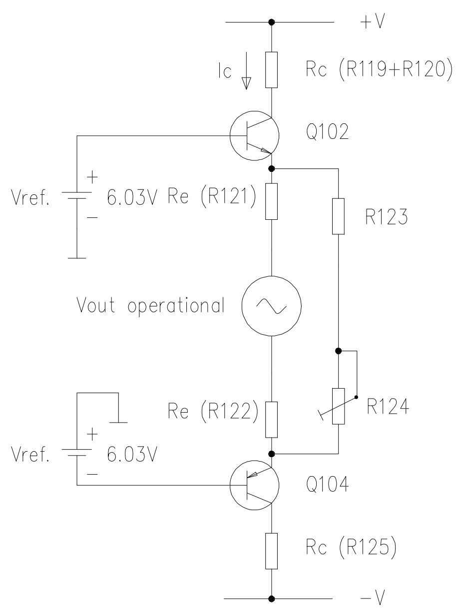


fig. 2

TEMPERATURE STABILIZING CIRCUIT

Temperature affects MOSFETs conduction in two different ways: first, the conduction threshold voltage has a negative temperature coefficient; second,the drain-source conduction resistance increases with temperature. Depending on which of the two things is predominating the temperature coefficient of the drain can be positive or negative. In our case, in which the gate-source voltage in the MOSFETs is very low when they conduct, the temperature coefficient of drain current -which is positive- is predominating.

To avoid thermal runaway in the polarizing current we must decrease the gate-source voltage as the MOSFETs get hot.Temperature stabilization is performed by modifying the reference voltage of both sources.If the temperature increases the Vref must decrease so that Ic and VRc decrease and, as a consequence, the gate-source voltage also decreases.

TEMPERATURE STABILIZING CIRCUIT

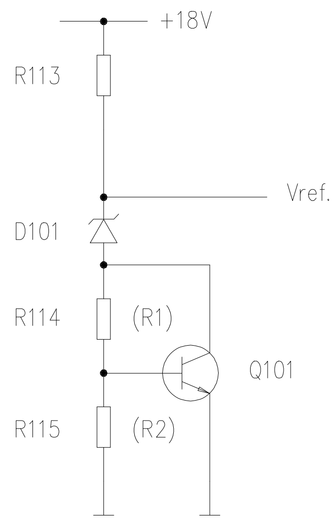


fig. 3

The circuit used is shown in figure 3. The base-emitter Vbe temperature/voltage feature is used to obtain the final result we need.The main idea is adequately choosing R1 and R2 to obtain the right temperature coefficient.

SYMMETRY ADJUST

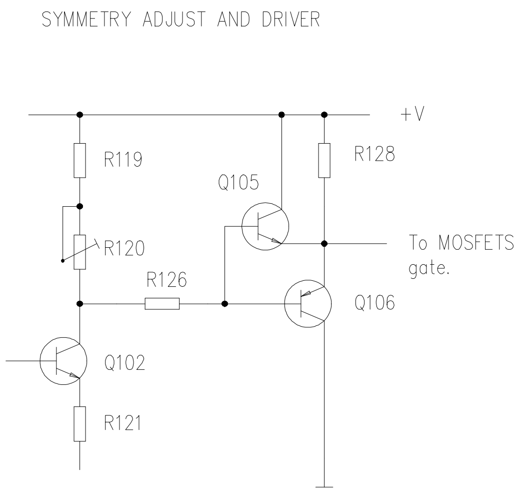


fig. 4

The threshold voltage varies much, even between MOSFETs of the same kind. When connecting them in parallel we must be careful that they all have the same conduction current if we want equal currents circulating in all of them. If the conduction voltage of P an N channels MOSFETs is not the same they will conduct different currents, even when we apply identical gate-source voltages. As the bias current of the N MOSFETs must be identical to the one of the P MOSFETs the feedback will correct the continuous voltage at the operational output to polarize the MOSFETs with different voltages untill both conduct equal currents.

If the operational output is not 0 V its capacitity to give voltage and current is not the same in both senses. To avoid this we must put a symmetry adjust. It is just an adjust which allows to vary the collector resistance of one of the current sources (R120).

The symmetry adjust does not correct the assymmetrical clipping saturation of the power amplifier with real load. This happens because the conduction resistors (Ron) of the MOSFETs N and P are not equal. Channel P has a higher Ron than channel N. This characteristic depends on the MOSFET's physical construction.

POWER MOSFETs

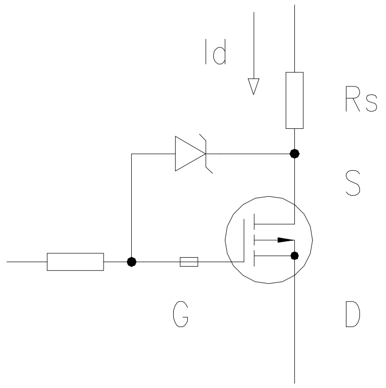
The MOSFETs used are IRFP9240 (P) and IRFP240 (N). They are assembled in a common source configuration so they can be completely saturated.

This kind of configuration has two drawbacks compared to a common drain one: less stability (because of the configuration gain itself) and high output impedance in open loop.

The source resistances (0.22Ω) are needed for the MOSFETs to work in parallel. E.g.: Two MOSFETs excited by the same Vgs voltage (gate-source voltage) of 5V. If they have different transconductance curves (Id function Vgs) they will conduct different drain currents; let's say 1A and 3A. The second one will dissipate more power and will get hotter.

The use of source resistances tends to match the current that each of the MOSFETs connected in parallel is conducting.

This resistance performs a negative feedback on the gate, lowering down the Vgs, relating to the drain current; like this:



Vgs = Vgg - Id*Rs

The higher the Id, the lower the Vgs voltage. The gate is protected by a zener, preventing a possible overload during an unexpected change from overload to real clipping.

Given the high input impedance and the broad frequency response of the MOSFETs there is a high risk of self-oscillations if all gates are excited connected to the same node. Intercalating serial resistances and ferrite beads at the gate this possibility is minimized, because the Q of the LC network made by the inductances and gate-source capacity is reduced.

PROTECTION CIRCUIT

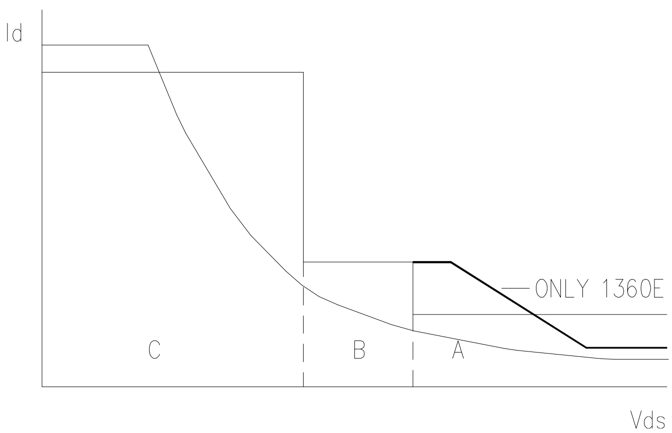
The protection circuit monitors the dissipated power at the MOSFETs stage. It has two basic parts:

MOSFET Id current detection.

MOSFET Vds voltage detection.

The goal is limiting the MOSFET so it works inside an area close to the SOA, as indicated in the figure. We chose channel N because, due to construction reasons, its SOA is lower.

The A Zone corresponds to very low loads; around 0Ω. As the voltage during load is very low, the voltage supported by the MOSFET will always be high. Protections must be activated with a very low current.



In this zone all zeners are working, because the voltage value at the extremes is high enough. Q124 and Q128 (fig. 5) are saturated, because their base currents are part of the zeners' current. If Q124 and Q128 are saturated then Q126 and Q130 (fig. 5) are, of course, open. because their base-emitter voltages will not be higher than 0,2 or 0,3V.

The divider made of R168,R174 (which can be or not in parallel, as we will see afterwards) and R178+R180 is not working, so we need low currents in the MOSFETs to get enough voltage over Rs to make Q122 (fig. 5) conduct.

The classical protection circuit of this amplifier series has been modified for the PAM1360 E model. The modification consists on exchanging a fixed step by a negative slope in the A zone of the figure, in order to active a better control of the current (Id) for high voltages (Vds). The reasons for this change are:
- If the step is low, the MOSFET will operate safely withing the SOA but distortions at low load impedances can arise beacause the protections will activate very fast.
- On the other hand, if we rise the step to avoid this problem, then the MOSFET will operate around 85 volts of Vds, a value too close to the 100 volts maximum Vds of the MOSFET. The solution is given by a negative slope wich is a compromise between both steps.

The N channel circuit is formed by D116, R158//R159, R160, R161, C120 and IC105. When the D116 threshold voltage is reached (62 volts), a current flows through IC105 and a 2.49 volt stable reference voltage is present at the output of IC105. This voltage is applied, through an RC filter, to the base of Q122 where is added to the current given by R178+180 (VRs), wich is proportional to the MOSFET (Id) current, thus obtaining the desired slope.

If $\rightarrow \uparrow$ Id $\rightarrow \uparrow$ VRs $\uparrow$ Ib (Q122) $\downarrow$ Vce(Q122) - saturated transistor

And hence, the MOSFET gate voltage is shorted.

VRs = Rs * Id   Id = VRs/Rs

VRs = Vbe(Q122) forgetting about voltage fall in R178+R180

Id = 0,7V / 0.22Ω = 3,18A

If Q122 is saturated its collector-emitter voltage can be considered as practically 0V. By looking at fig. 5 we can see taht we are forcing the base of Q107 to 0V or, what is the same, the voltage Vbe(Q107 and Q108)+Vgs of the MOSFETs (N), cutting automatically the current supply to the load.

Now let's see the case in which the load has got a value a bit higher than in the previous case (≈0,5Ω); the voltage over the load will also be higher for the same current value. Let's suppose the voltage over the load is high enough to make the D121/D122 zeners group stop conducting (threshold from A Zone to B Zone). At this time Q128 stops saturating because of a lack of current in its base. This makes Q130 (fig. 5) go into saturation, because the current supplied by R174 is now circulating through its base. The result of this is that we have a resistive divider in the base of Q122,made of R176/R178+R180, which translates into an increase of the voltage needed to saturate Q122 or, what is the same, an increase of the current circulating through the MOSFETs (Id).

If the load has a higher value than in the previous cases (≈1Ω), but with a much lower value than the nominal of 4Ω, because of the same reasons, D118 will stop conducting and the second divider will begin working, being in the C Zone. The circuit would be as follows: R168 in parallel with R176 and both of them making up a divider together with R178+180. The current Id needed for Q122 to saturate will be much higher than in the previous cases.

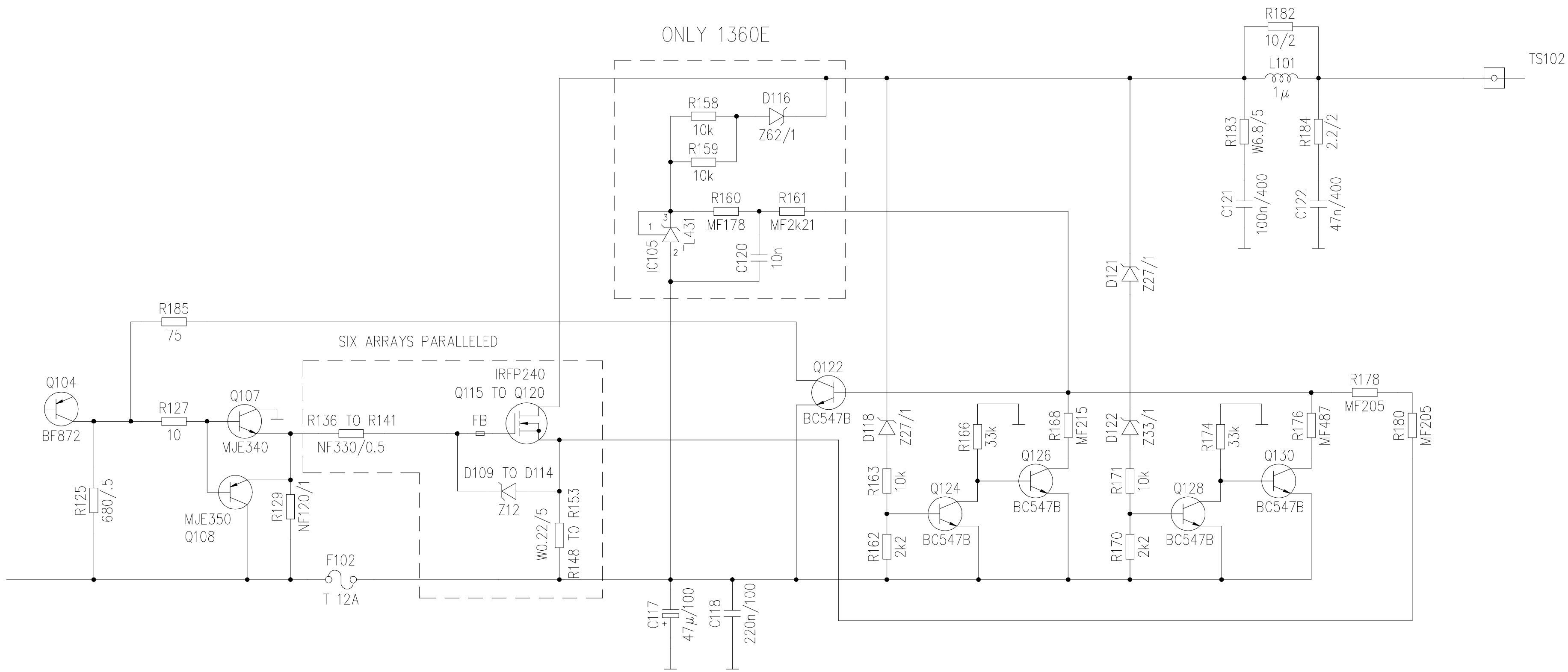

ONLY 1360E
R182
10/2
L101
1µ
TS102
R158
10k
D116
Z62/1
R159
10k
R160
MF178
R161
MF2k21
IC105
TL431
C120
10n
R183
W6.8/5
C121
100n/400
R184
2.2/2
C122
47n/400
D121
Z27/1
R185
75
SIX ARRAYS PARALLELED
IRFP240
Q115 TO Q120
Q104
BF872
R127
10
Q107
MJE340
R136 TO R141
NF330/0.5
FB
D109 TO D114
Z12
MJE350
Q108
R129
NF120/1
R125
680/.5
W0.22/5
R148 TO R153
F102
T 12A
C117
47µ/100
C118
220n/100
Q122
BC547B
D118
Z27/1
R163
10k
R162
2k2
R166
33k
Q124
BC547B
Q126
BC547B
R168
MF215
D122
Z33/1
R171
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MF487
R178
MF205
R180
MF205

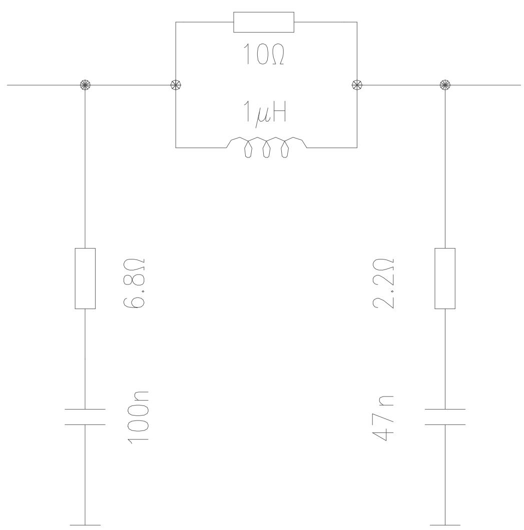
Fig. 5

ZOBEL NETWORK

This circuit tries to get a constant load impedance for the power module, in spite of the amplifier's load and frequency, to avoid phase shifting of the feedback signal.

The values have been experimentally calculated through a study with square signal by trying to minimize the power amplifier's ringing with very capacitive loads (2,2μF//4Ω).

The Zobel Network eliminates possible oscillations of the MOSFETs between 5MHz and 10MHz, too. This is why it must be physically placed at the module's output, avoiding long wiring. Great care must be taken for the signal not to be too shifted at the output, because the feedback could turn negative.



FEEDBACK

The whole amplifier is compensated with just one capacity, which places the amplifier's general pole at:

$$Fp = \frac{1}{2*p*Rf*Cf} = 140kHz$$

Rf = R112   Cf = C105+C104

DC PROTECTION CIRCUIT 11.0650 OPERATION-DESCRIPTION

Fig. 6 corresponds to the DC OUT circuit of channel L. Its mission is protect the loudspeakers when the module fails and there is some continuous voltage appearing at the output. Voltages shown in the figure correspond to rest state and they are given by the dividers made of R146-R147 and R150-R148. If we apply Ohm's Law to these dividers we can obtain these voltages, taking into account that the module's output at rest state (no signal) is 0V.

Let's remember the function of a NOR gate, like 4001.

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

The circuit is only sensitive to frequencies lower than 5Hz, which warranties a correct operation at any time. This is determined by the time constant made by the resistances and capacity at the gates input.

Let's now suppose that there is a continuous voltage appearing at the module output, because of any malfunction.

This will make the voltage dividers lose their balance -no matter if it is positively or negatively- and the gate output will be 0V. This will make the NAND (HEF4011, pin 10) change its sate, putting the inverter output (pin 11) also to 0V. This attacks the base of Q102, cutting its current supply. Then the relay K101 opens and this makes the PROTEC LEDs light up, because the two NAND gates that are controlling them are connected to this point. Zeners D109 and D111 are there to protect the gates, avoiding their voltage to go higher than 8.2V if the output voltage is positive and lower than -0.6V if its negative. As you can see, in this case the zener is playing the role of a diode.

DC OUT PROTECTIONS CIRCUIT

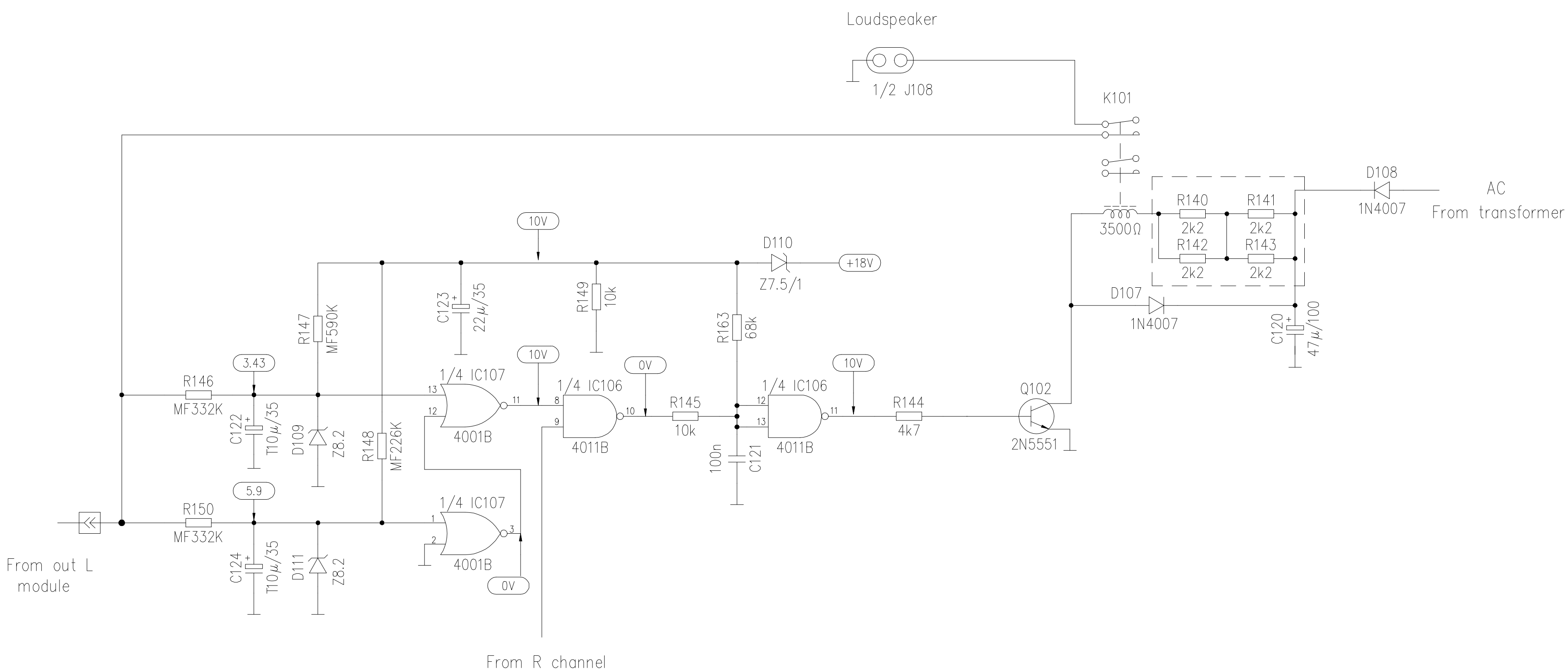


Fig. 6

CLIP CIRCUIT

This circuit is shown in fig. 7. The clip threshold, or point in which we want the LED to light up, is determined by the zener diode D117 or D115. In our case this is between 0,5 and 1dB or, what is the same, when the output signal level over the load reaches a value close to the power supply (+V), exactly Vout = V - 5,6V, moment in which Q104 or Q103 loses the base-emitter voltage, stopping conduction. This makes the zener D116 or D114 voltage dissapear (0V) and the IC106 (pin3 or 4) output become a logic "1" (+10V), lighting up the LED.

CLIP CIRCUIT

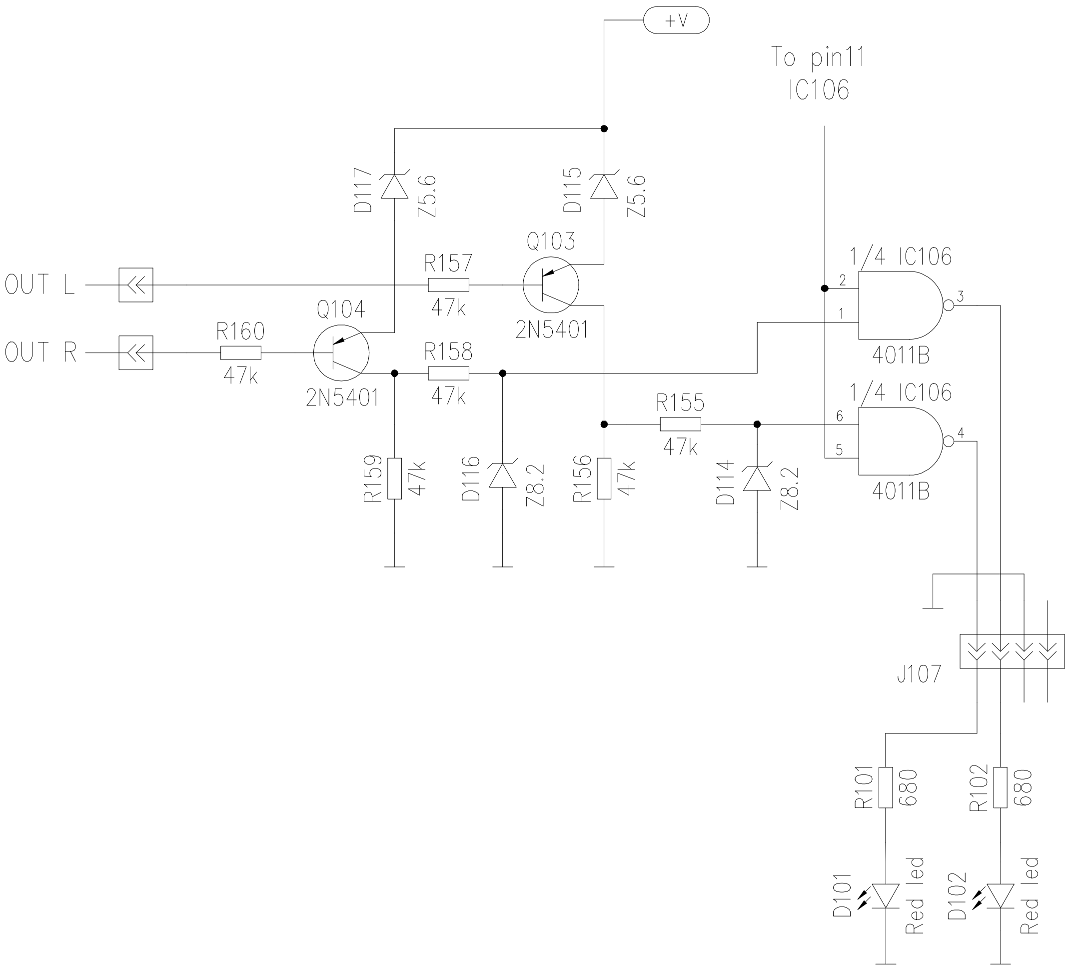


Fig. 7

TEMPERATURE DETECTOR

This circuit (fig. 8) is calculated to operate over the output relay opening it if any of both modules' temperature excedes 90°C, approximately. It is made with a comparator per channel (L-R), resident in the same IC104. Both share a reference voltage provided by IC105 (TL431A), which gives excellent stability at that voltage ±1%. These comparators reveive, the signal from their probes, comparing them with the Vref.Once this voltage is surpassed by any of both probes, the output of the corresponding comparator is balanced to the power supply (+12V), acting through D106, R138, over the base of transistor Q101, which makes the relay open. This output is also connected to the THERMAL LED, which light up as the relay are open.

THERMAL DETECTOR CIRCUIT

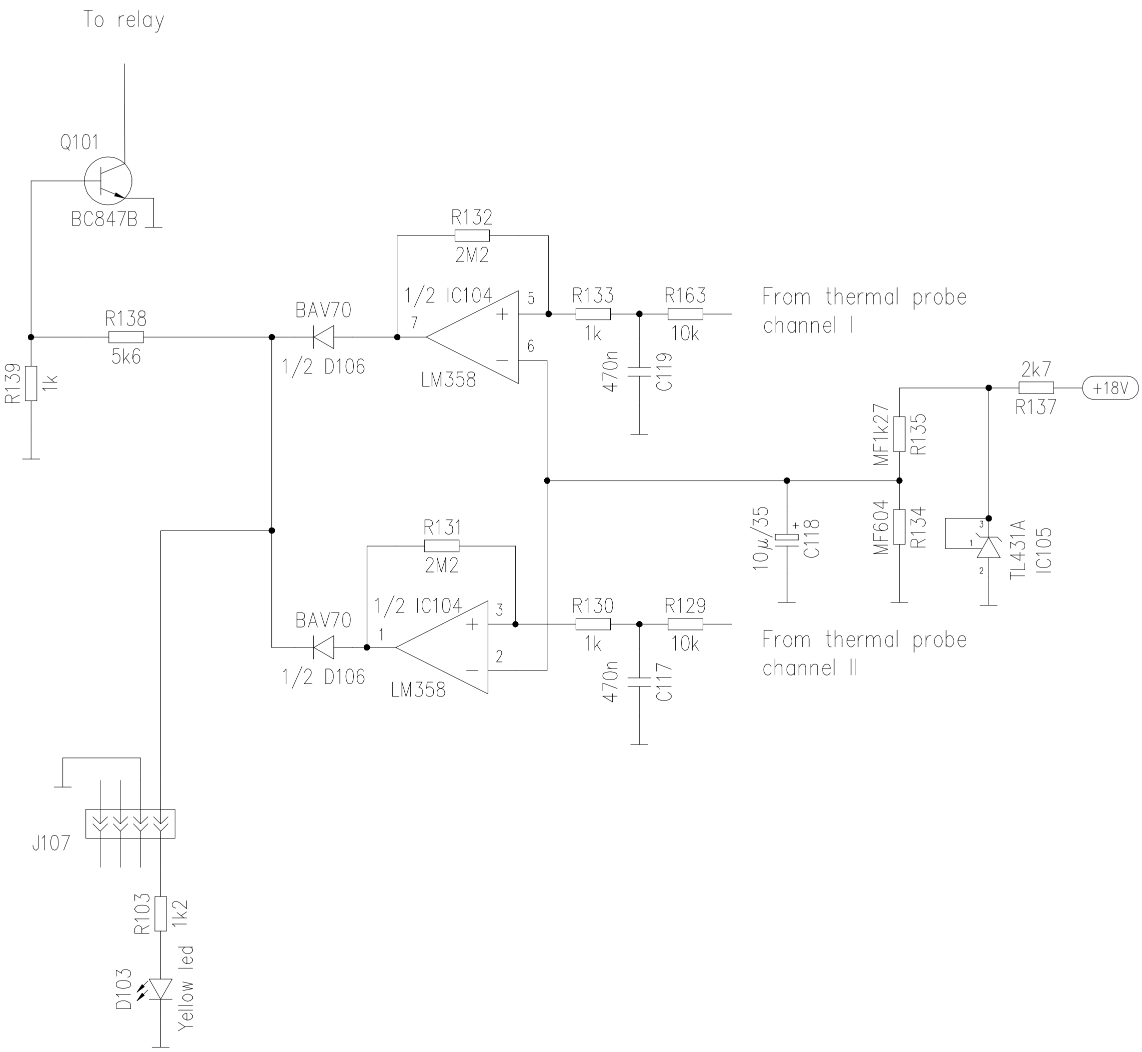


Fig. 8

THERMAL PROBE DC AMPLIFIER

The cooling fan speed is automatically regulated in relation to the power module's temperature, which is read by a thermal probe (LM35D), jointly linked to the heat sink.

The high sensitivity thermal probe gives variations of de 10mV for every °C. This voltage is picked up and amplified by the IC103 (LM358). Of course, there is a probe for each L and R heat sink. The output of both amplifiers is linked through two diode D105, making an O gate, whose cathodes go to the regulator, applying the DC of any of them to the regulator. This provides a variable voltage at its output which oscillates from a minimum of approximately 7V for a temperature of 20 °C (cold heat sink) to a maximum of 15V for temperatures of 80 °C or higher. The gain of the amplifiers has been calculated for this temperatures window. The maximum voltage allowed by the heat sink in order to work properly is 15V. This maximum is given by the zener D122 (Z10/1), as the regulator is a 7805 the voltage will be as maximum 10 + 5 = 15V. When the zener is not working (not enough voltage) the voltage on the fan will be the output amplifiers' , less 0.6V (diodes fall), plus the 5V of the IC110.

THERMAL PROBE DC AMPLIFIER

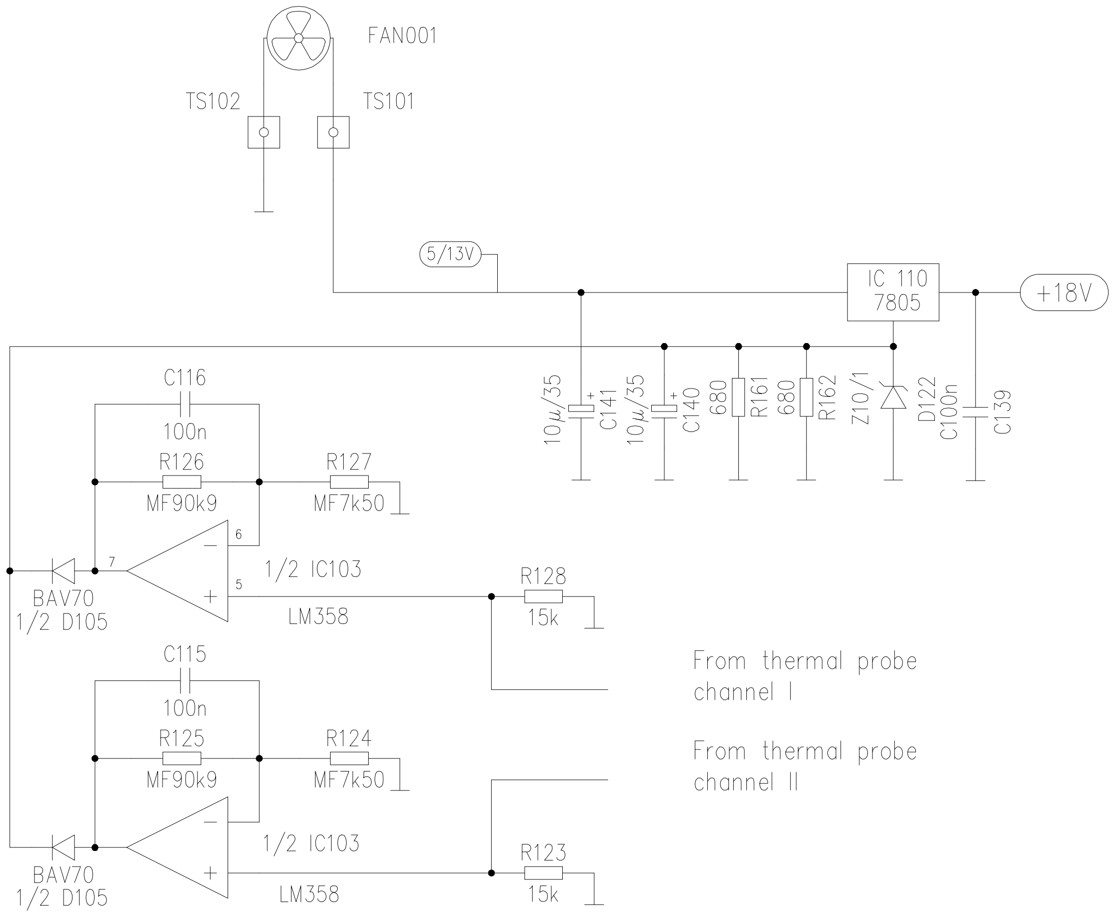
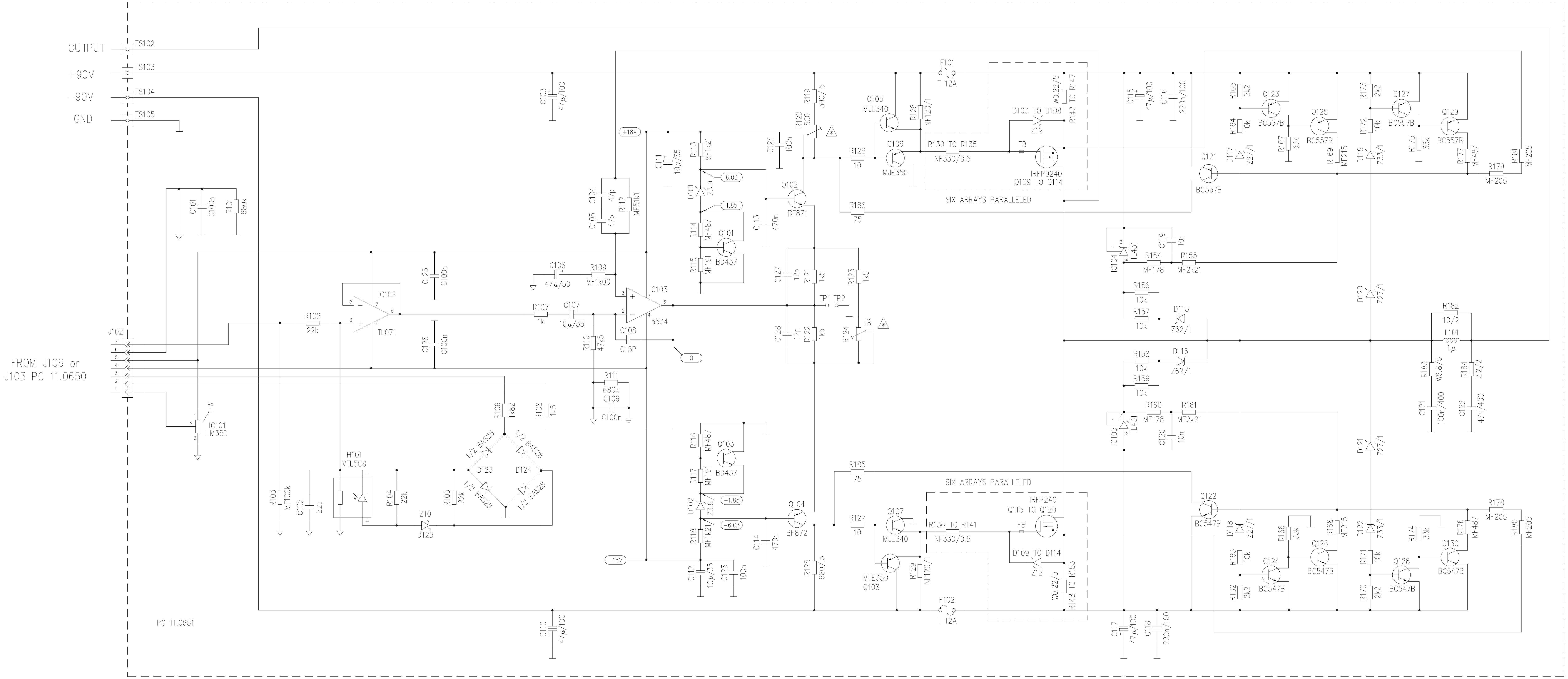
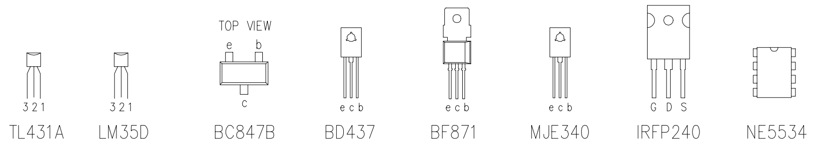


Fig. 9



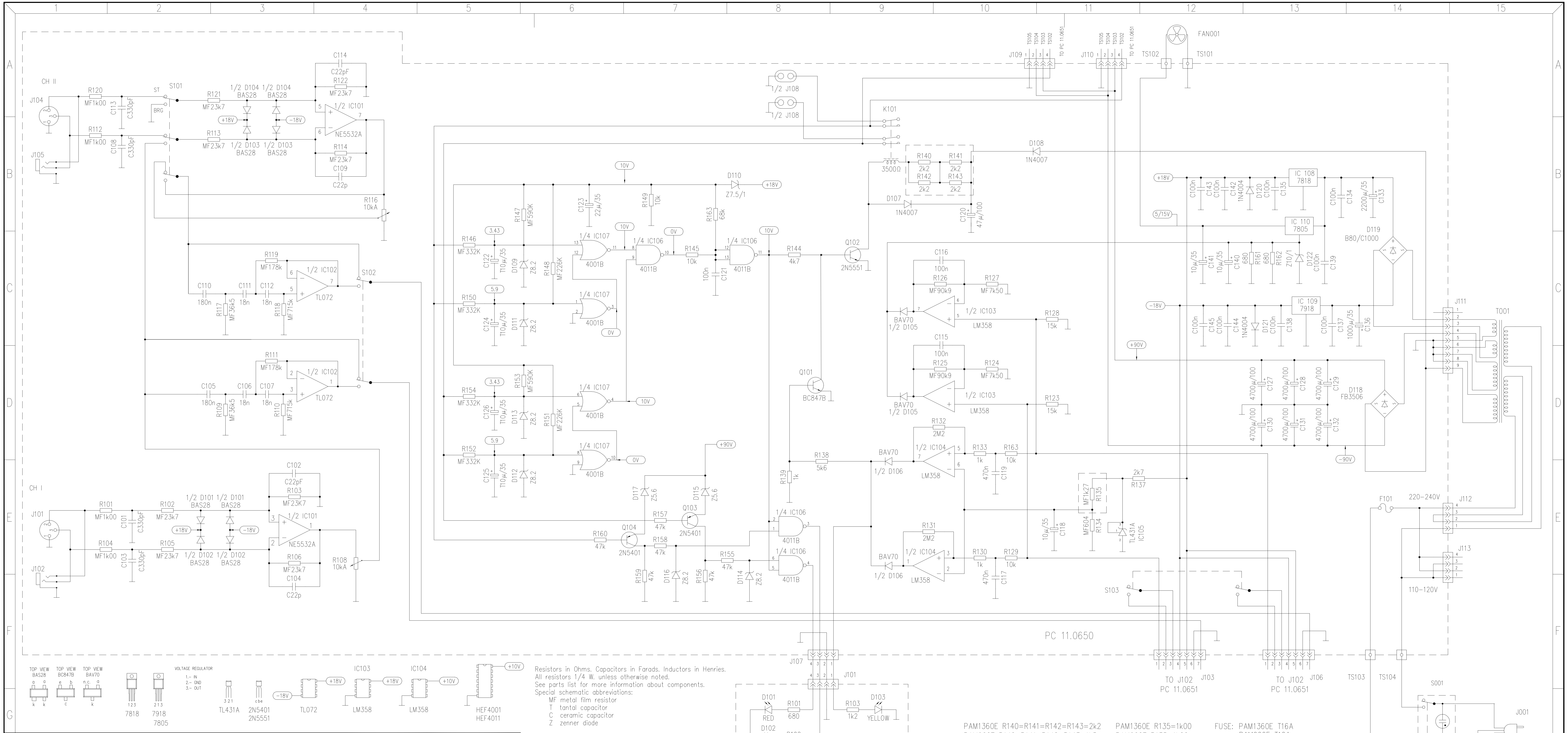


All capacitors 63 V. unless otherwise noted.
Resistors in Ohms. Capacitors in Farads. Inductors in Henries.
All resistors 1/4 W. unless otherwise noted.
See parts list for more information about components.

△ Factory adjusted.

Special schematic abbreviations:
MF metal film resistor
W wounded wire resistor
NF non inflammable resistor
C ceramic capacitor
Z zenner diode

TITLE: SWITCHING POWER MOSFET AMPLIFIER		MODEL: PAM1360 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
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DRAWN: J.QUERALT	DATE: 17.03.98	REPLACES:	DRW. NO. 10.0428 / REV.
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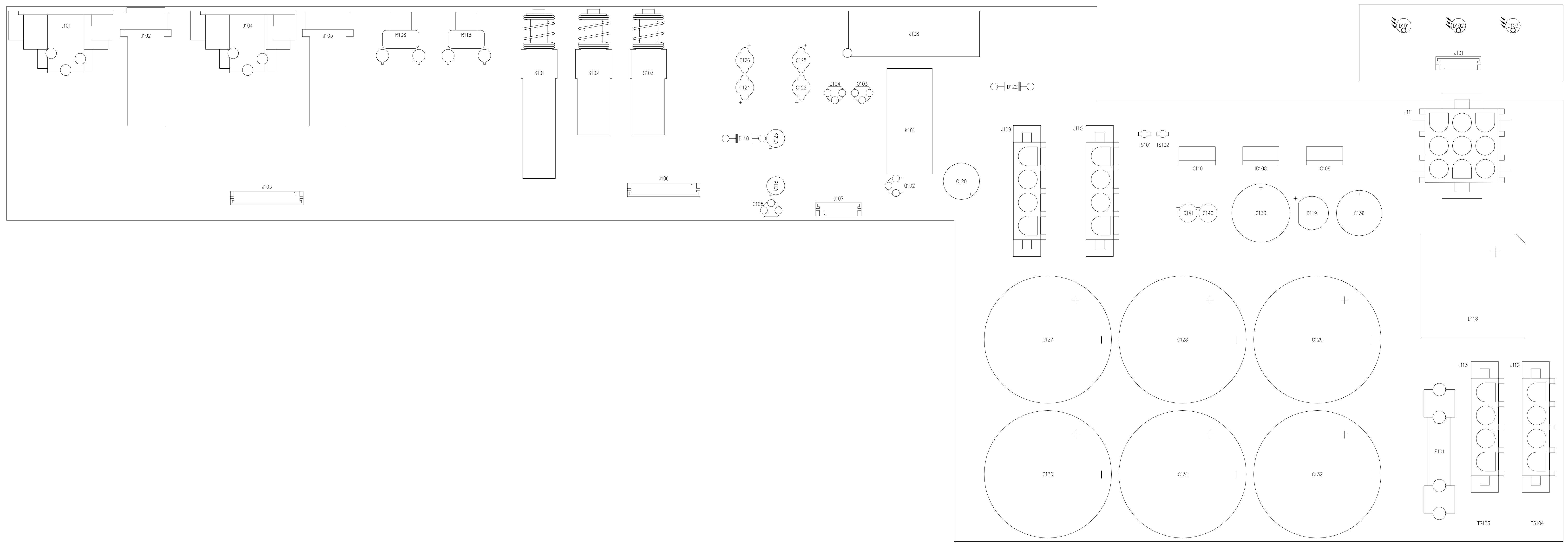
Resistors in Ohms. Capacitors in Farads. Inductors in Henries.
All resistors 1/4 W. unless otherwise noted.
See parts list for more information about components.
Special schematic abbreviations:
MF metal film resistor
T tantal capacitor
C ceramic capacitor
Z zenner diode

PAM1360E R140=R141=R142=R143=2k2
PAM960E R140=R141=R142=R143=1k5
PAM560E R140=R141=R142=R143=560
PAM360E R140=R141=R142=R143=0

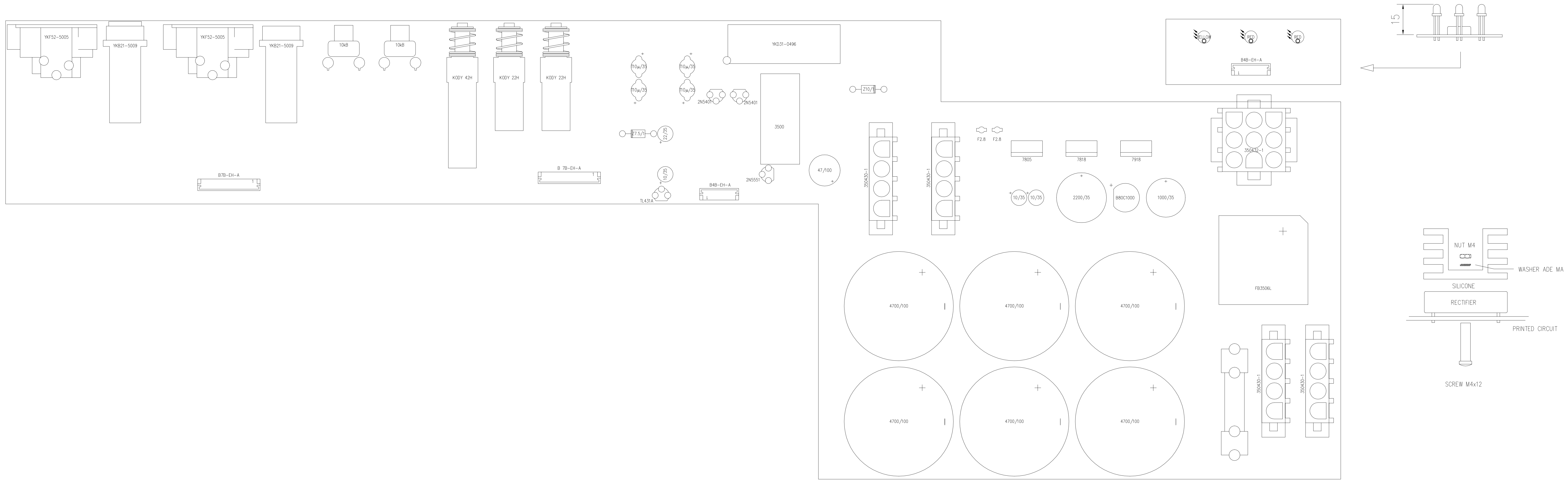
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PAM960E R135=1k00
PAM560E R135=1k27
PAM360E R135=1k27

FUSE: PAM1360E T16A
PAM960E T10A
PAM560E T6.3A
PAM360E T6.3A

TITLE: INPUT CIRCUIT and DC OUT, THERMAL PROTECTION CIRCUIT	MODEL: PAM1360/960/560/360E SHEET 2 OF 2	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA	
DRAWN: J.QUERALT	DATE: 17.03.98	REPLACES:	DRW. NO. 10.0429	REV. B
CHECKED:	DATE:	REPLACED BY:		



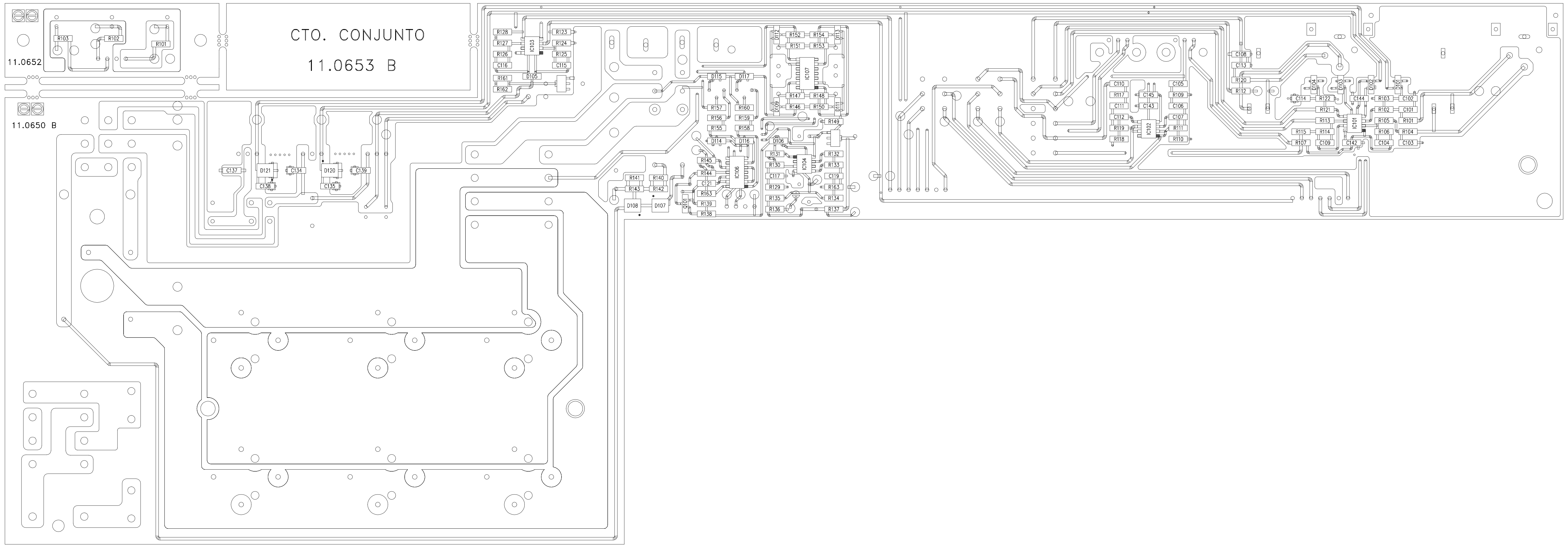
TITLE: INPUTS AND POWER SUPPLY	MODEL: PAM1360E/960E/560E/360E SHEET 1 OF 14	ECLER LABORATORIO DE ELECTRO–ACUSTICA BARCELONA ESPAÑA
DRAWN: AMOROS/QUERALT — DATE: 11.02.98	REPLACES:	DRW. NO. 33.0268 R — REV.
CHECKED: — DATE:	REPLACED BY:	



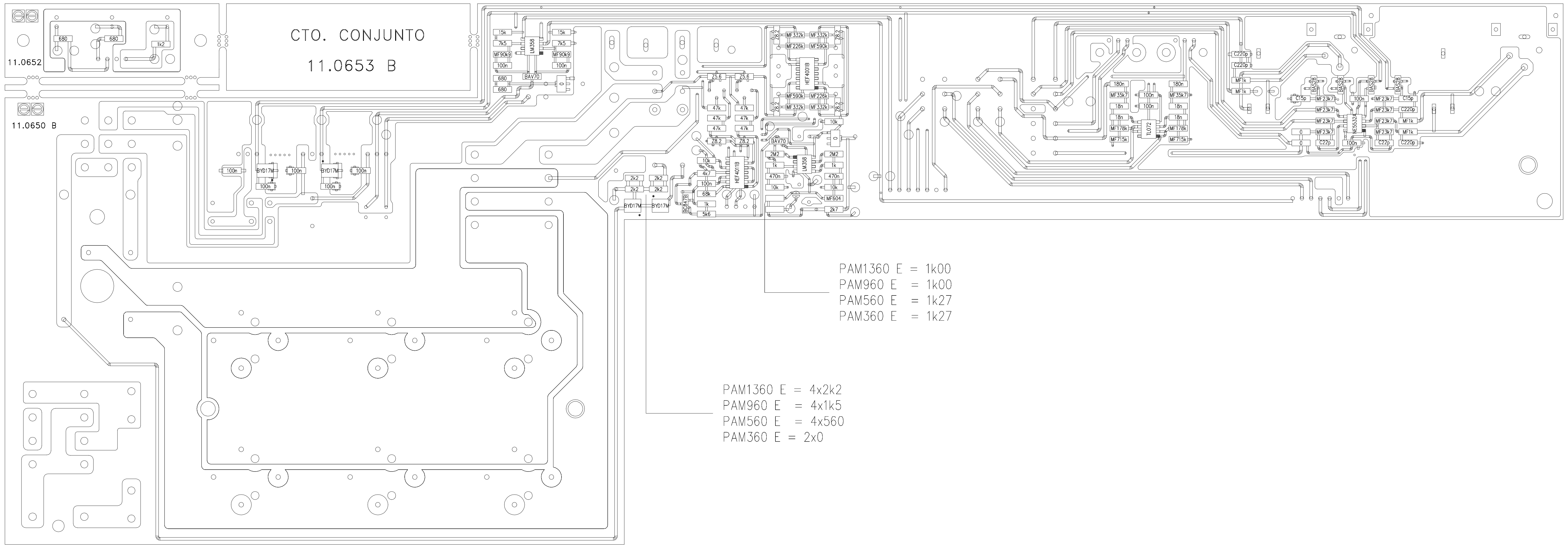
POWER SUPPLY CAPACITORS
PAM1360E = 3x4700 µF (+V) and (−V)
PAM960E = 3x4700 µF (+V) and (−V)
PAM560E = 2x4700 µF (+V) and (−V)
PAM360E = 2x4700 µF (+V) and (−V)

FUSE F101
PAM1360E = 16A
PAM960E = 10A
PAM560E = 6.3A
PAM360E =6.3A

TITLE: INPUTS AND POWER SUPPLY		MODEL: PAM1360E/960E/560E/360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
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CHECKED:	DATE:	REPLACED BY:	



TITLE: SMD INPUTS AND POWER SUPPLY		MODEL: PAM1360-960-560-360 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
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DRAWN: AMOROS/QUERALT	DATE:	REPLACES:	DRW. NO. 33.0269 R — REV. C
CHECKED:	DATE:	REPLACED BY:	



PAM1360 E = 1k00
PAM960 E = 1k00
PAM560 E = 1k27
PAM360 E = 1k27

PAM1360 E = 4x2k2
PAM960 E = 4x1k5
PAM560 E = 4x560
PAM360 E = 2x0

TITLE: SMD INPUTS AND POWER SUPPLY		MODEL: PAM1360-960-560-360 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 4 OF 14	
DRAWN: AMOROS/QUERALT	DATE:	REPLACES:	DRW. NO. 33.0269 V — REV. C
CHECKED:	DATE:	REPLACED BY:	

PARTS LIST:	INPUTS,DC OUT,THERMAL and	REV:
MODEL: PAM1360E/960E	POWER SUPPLY	
560E/360	DRW.Nº 33.0268C and 269C PL	REPLACES:
DATE: 11.02.98	SHEET 1 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
C101	C220p	FCXCN22200
C102	C15p	FCXCN11500
C103	C220p	FCXCN22200
C104	C8p2	FCXCN08200
C105	180n	FCXCN41800
C106	18n	FCXCN40180
C107	18n	FCXCN40180
C108	C220p	FCXCN22200
C109	C8p2	FCXCN08200
C110	180n	FCXCN41800
C111	18n	FCXCN40180
C112	18n	FCXCN40180
C113	C220p	FCXCN22200
C114	C15p	FCXCN11500
C115	100n	FCXCN41000
C116	100n	FCXCN41000
C117	470n	FCXCN44700
C118	10µ/35	FCCE250100
C119	470n	FCXCN44700
C120	47µ/100	FCCE350470
C121	100n	FCXCN41000
C122	T10µ/35	FCCG001000
C123	22µ/35	FCCE200220
C124	T10µ/35	FCCG001000
C125	T10µ/35	FCCG001000
C126	T10µ/35	FCCG001000
C127	4700µ/100	FCCE331525
C128	4700µ/100	FCCE331525
C129	4700µ/100	FCCE331525
C130	4700µ/100	FCCE331525
C131	4700µ/100	FCCE331525
C132	4700µ/100	FCCE331525
C133	2200µ/35	FCCE212200
C134	100n	FCXCN41000
C135	100n	FCXCN41000
C136	1000µ/35	FCCE211000
C137	100n	FCXCN41000
C138	100n	FCXCN41000
C139	100n	FCXCN41000
C140	10µ/35	FCCE250100
C141	10µ/35	FCCE250100
C142	100n	FCXCN41000
C143	100n	FCXCN41000
C144	100n	FCXCN41000
C145	100n	FCXCN41000
D101	BAS28	FCXDDBAS28
D102	BAS28	FCXDDBAS28
D103	BAS28	FCXDDBAS28
D104	BAS28	FCXDDBAS28
D105	BAV70	FCXDDBAV70
D106	BAV70	FCXDDBAV70
D107	BYD17M	FCXDD40070
D108	BYD17M	FCXDD40070
D109	Z8.2	FCXZ000082
D110	Z7.5/1	FCDD100750
D111	Z8.2	FCXZ000082
D112	Z8.2	FCXZ000082

REFERENCE	VALUE	CODE
D113	Z8.2	FCXZ000082
D114	Z8.2	FCXZ000082
D115	Z5.6	FCXZ000056
D116	Z8.2	FCXZ000082
D117	Z5.6	FCXZ000056
D118	FB3506L	FCREC35065
D119	B80C1000	FCREC80100
D120	BYD17M	FCXDD40070
D121	BYD17M	FCXDD40070
D122	Z10/1	FCDD101000
F101	T 16A	FCFUS60400
IC101	NE5532A	FCIC553200
IC102	TL072	FCIC072010
IC103	LM358	FCXIC03580
IC104	LM358	FCXIC03580
IC105	TL431A	FCIC431000
IC106	HEF4011B	FCIC401101
IC107	HEF4001B	FCIC400101
IC108	REGU. 7818	FCREG78180
IC109	REGU. 7918	FCREG79180
IC110	REGU.7805	FCREG78050
J101	YKF52-5005	FCBASX0900
J102	YKB21-5009	FCBASJ0200
J103	B7B-EH-A	FCCTM00070
J104	YKF52-5005	FCBASX0900
J105	YKB21-5009	FCBASJ0200
J106	B 7B-EH-A	FCCTM00070
J107	B4B-EH-A	FCCTM00040
J107	B4B-EH-A	FCCTM00040
J108	YKD31-0496	FCCTJAL100
J109	350430-1	FCCTAMP040
J110	350430-1	FCCTAMP040
J111	350432-1	FCCTAMP040
J112	350430-1	FCCTAMP090
J113	350430-1	FCCTAMP040
K101	RELAY 3500 Ohms	FCREL10350
Q101	BC847B	FCXTT08470
Q102	2N5551	FCTR255510
Q103	2N5401	FCTR254010
Q104	2N5401	FCTR254010
R101	MF1k	FCXR131000
R102	MF23k7	FCXR142370
R103	MF23k7	FCXR142370
R104	MF1k	FCXR131000
R105	MF23k7	FCXR142370
R106	MF23k7	FCXR142370
R107	56 Ohms	FCXR015600
R108	10kB	FCPR110020
R109	MF36k5	FCXR143650
R110	MF715k	FCXR157150
R111	MF178k	FCXR151780
R112	MF1k	FCXR131000
R113	MF23k7	FCXR142370
R114	MF23k7	FCXR142370
R115	56 Ohms	FCXR015600
R116	10kB	FCPR110020
R117	MF36k5	FCXR143650

PARTS LIST:	INPUTS,DC OUT,THERMAL and	REV:
MODEL: PAM1360E/960E	POWER SUPPLY	
560E/360	DRW.Nº 33.0268 and 269PL	REPLACES:
DATE: 11.02.98	SHEET 3 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
R118	MF715k	FCXR157150
R119	MF178k	FCXR151780
R120	MF1k	FCXR131000
R121	MF23k7	FCXR142370
R122	MF23k7	FCXR142370
R123	15k	FCXR041500
R124	7k5	FCXR037500
R125	MF90k9	FCXR149090
R126	MF90k9	FCXR149090
R127	7k5	FCXR037500
R128	15k	FCXR041500
R129	10k	FCXR041000
R130	1k	FCXR031000
R131	2M2	FCXR062200
R132	2M2	FCXR062200
R133	1k	FCXR031000
R134	MF604	FCXR126040
R135	MF1k74	FCXR131740
R136	MF8k06	FCXR138060
R137	2k7	FCXR032700
R138	5k6	FCXR035600
R139	1k	FCXR031000
R140	2k2	FCXR032200
R141	2k2	FCXR032200
R142	2k2	FCXR032200
R143	2k2	FCXR032200
R144	4k7	FCXR034700
R145	10k	FCXR041000
R146	MF332k	FCXR153320
R147	MF590k	FCXR155900
R148	MF226k	FCXR152260
R149	10k	FCXR041000
R150	MF332k	FCXR153320
R151	MF226k	FCXR152260
R152	MF332k	FCXR153320
R153	MF590k	FCXR155900
R154	MF332k	FCXR153320
R155	47k	FCXR044700
R156	47k	FCXR044700
R157	47k	FCXR044700
R158	47k	FCXR044700
R159	47k	FCXR044700
R160	47k	FCXR044700
R161	680 Ohms	FCXR026800
R162	680 Ohms	FCXR026800
R163	10k	FCXR041000
S101	SWITCH KODY 42H	FCINTK2000
S102	SWITCH KODY 22H	FCINTK2000
S103	SWITCH KODY 22H	FCINTK2000
TS101	Faston 2.8mm	FCTERMF280
TS102	Faston 2.8mm	FCTERMF280
PC 11.0653	PRINTED CIRCUIT	FCCIPAM653
PC 11.0652	PRINTED CIRCUIT	
R101	1k2	FCXR031200
R102	680 Ohms	FCXR026800
R103	680 Ohms	FCXR026800

PARTS LIST:	INPUTS,DC OUT,THERMAL and	REV:
MODEL: PAM1360E/960E	POWER SUPPLY	
560E/360	DRW.Nº 33.0268 and 269PL	REPLACES:
DATE: 11.02.98	SHEET 4 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
D101	Yellow led 3mm	FCLED300AM
D102	Red led 3mm	FCLED300RO
D103	Red led 3mm	FCLED300VE
J101	B5B-EH-A	FCCTM00050

Note: for PAM960E

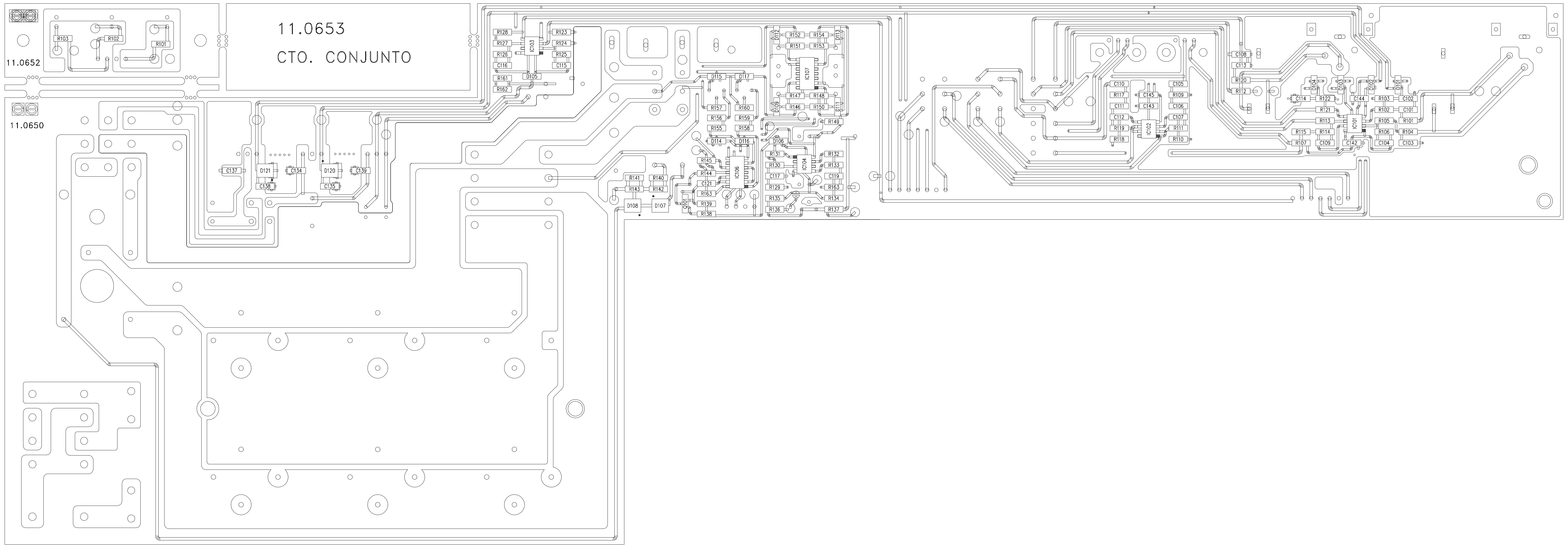
R141	1k5	FCXR031500
R142	1k5	FCXR031500
R143	1k5	FCXR031500
R144	1k5	FCXR031500
F101	T 10A	FCFUS60100

Note: for PAM560E

R141	560 Ohms	FCXR025600
R142	560 Ohms	FCXR025600
R143	560 Ohms	FCXR025600
R144	560 Ohms	FCXR025600
F101	T 6.3A	FCFUS60500

Note: for PAM360E

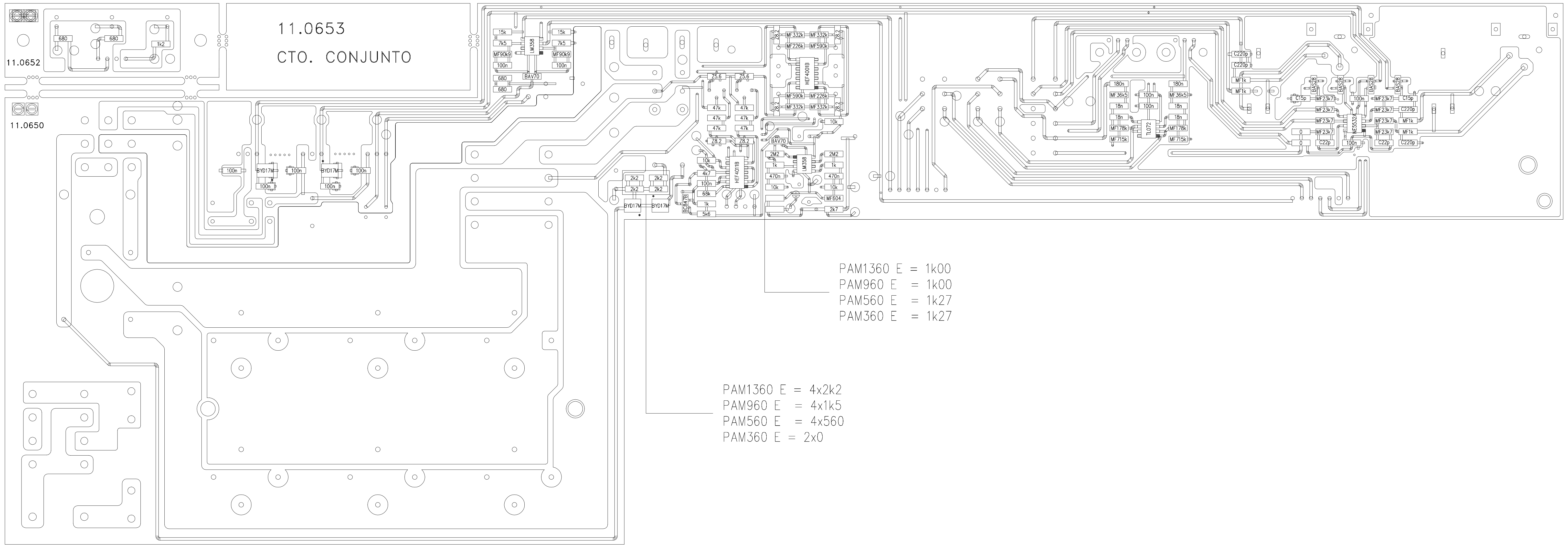
R141	0 Ohms	FCXR000000
R142	0 Ohms	FCXR000000
R143	Not assembled	
R144	Not assembled	
F101	T 6.3A	FCFUS60500



OLD VERSION

TITLE: SMD INPUTS AND POWER SUPPLY	MODEL: PAM1360-960-560-360 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
	SHEET 3 OF 14	
DRAWN: AMOROS/QUERALT DATE:	REPLACES:	DRW. NO. 33.0269 R / REV. B
CHECKED: DATE:	REPLACED BY:	

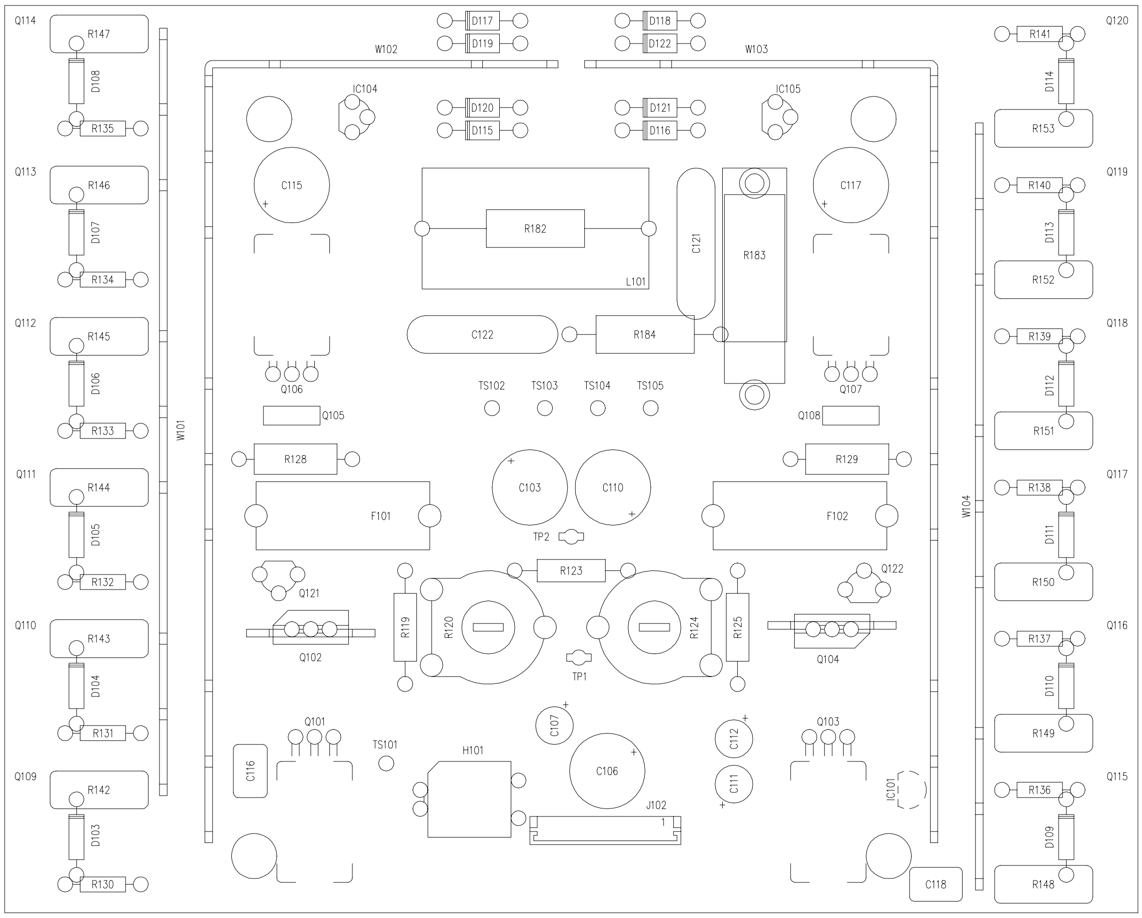
OLD VERSION



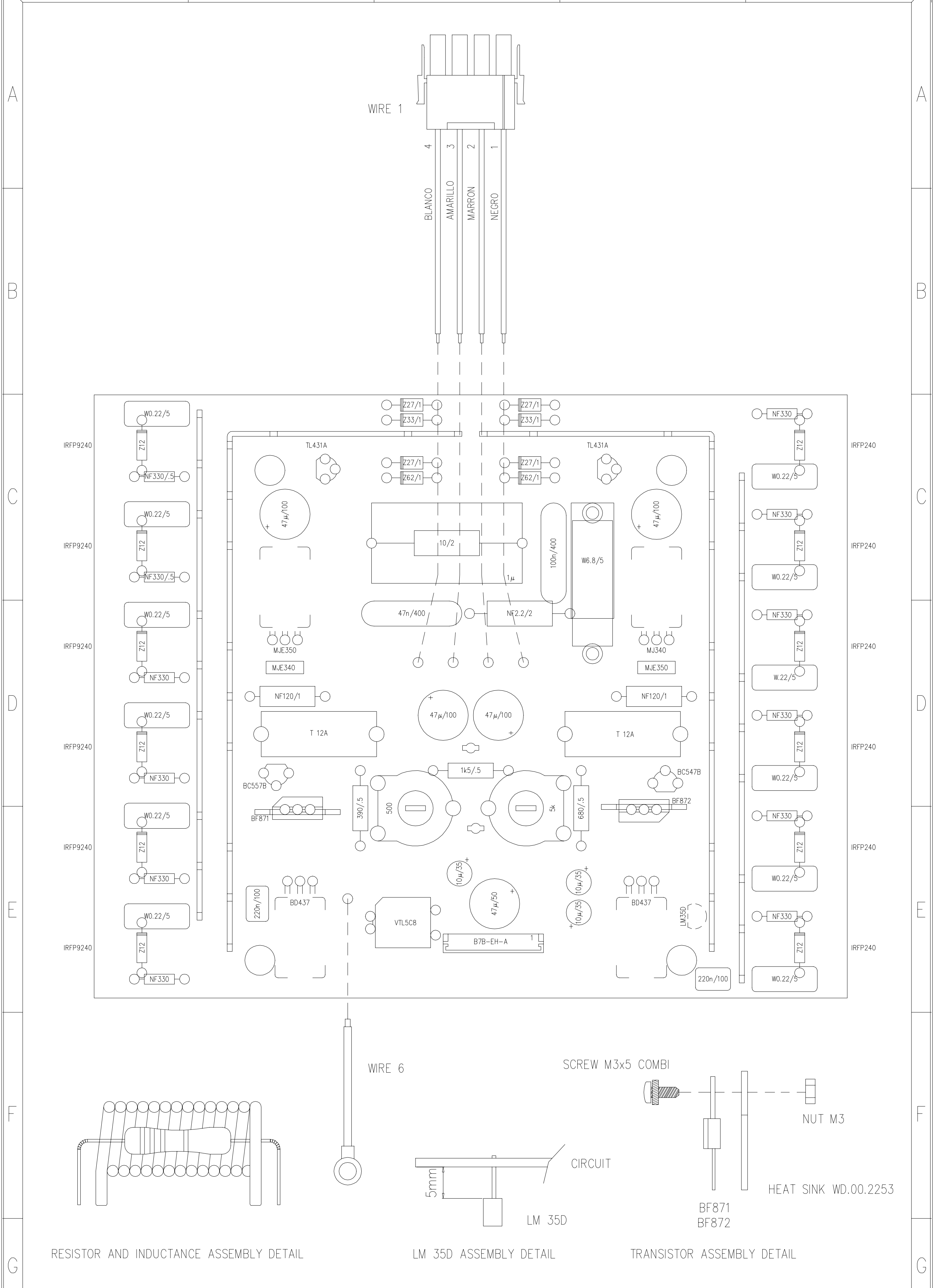
PAM1360 E = 1k00
PAM960 E = 1k00
PAM560 E = 1k27
PAM360 E = 1k27

PAM1360 E = 4x2k2
PAM960 E = 4x1k5
PAM560 E = 4x560
PAM360 E = 2x0

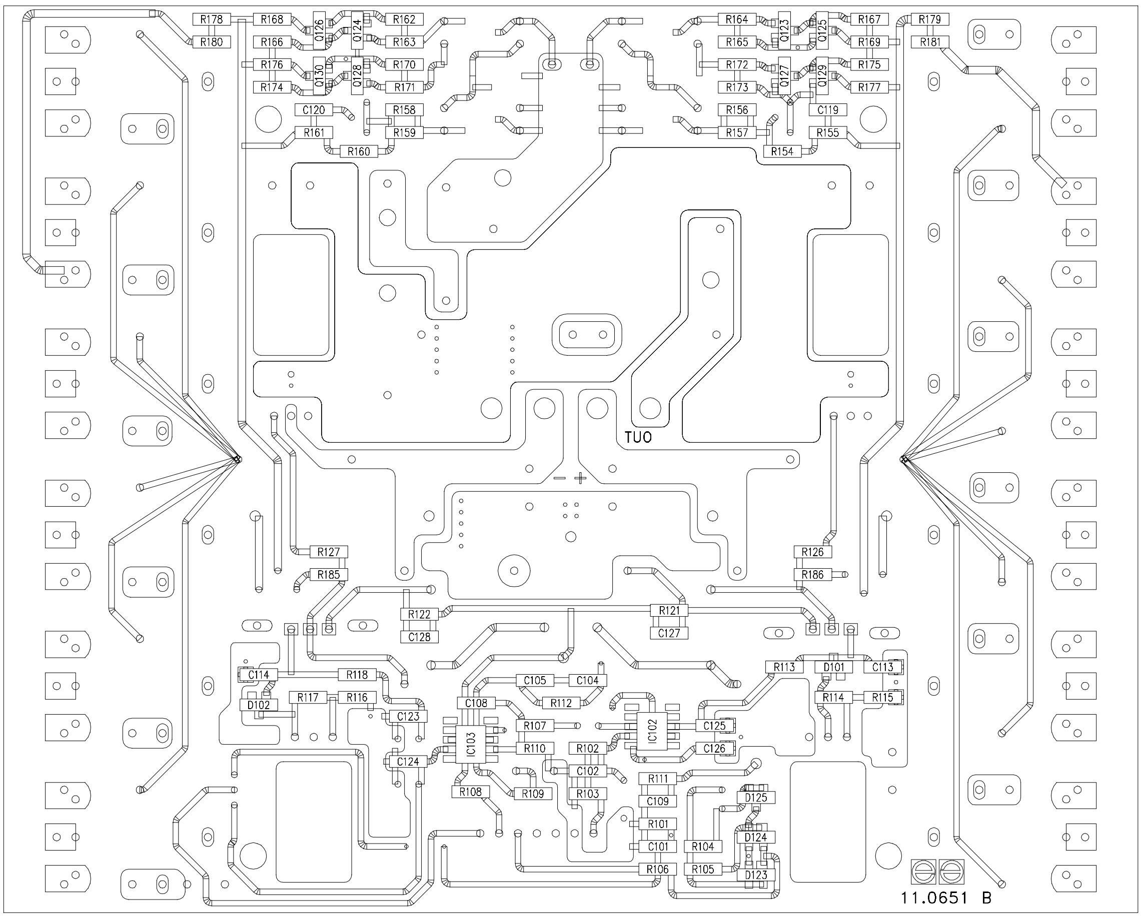
TITLE: SMD INPUTS AND POWER SUPPLY	MODEL: PAM1360-960-560-360 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA	
	SHEET 4 OF 14		
DRAWN: AMOROS/QUERALT DATE:	REPLACES:	DRW. NO. 33.0269 V	REV. B
CHECKED: DATE:	REPLACED BY:		



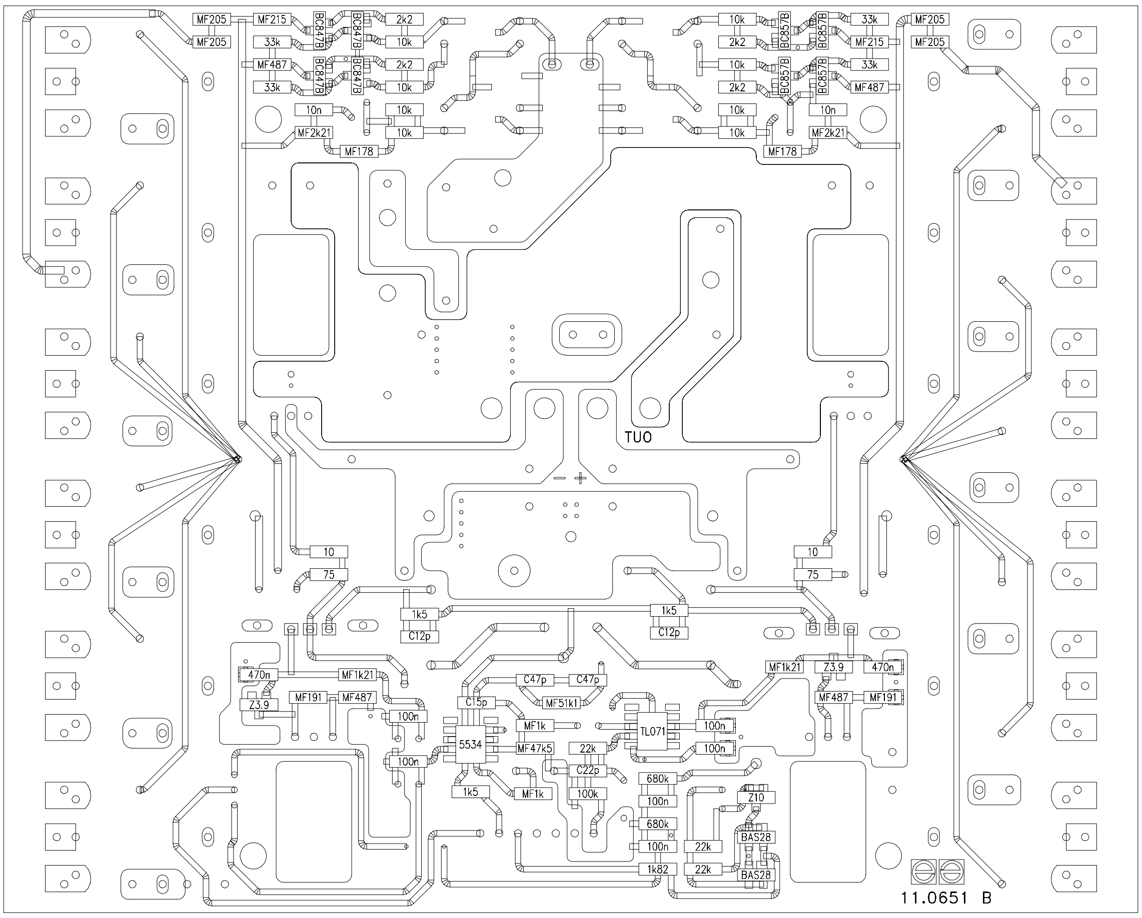
TITLE: PRINTED CIRCUIT 11.0651 B		MODEL: PAM1360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 5 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0266 R — REV. B
CHECKED:	DATE:	REPLACED BY:	



TITLE: PRINTED CIRCUIT 11.0651 B		MODEL: PAM1360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 6 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0266 V / REV. B
CHECKED:	DATE:	REPLACED BY:	



TITLE: PRINTED CIRCUIT 11.0651 B		MODEL: PAM1360E/960E/560E/360E	ECLER
		SHEET 7 OF 14	LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0267R	REV. B
CHECKED:	DATE:	REPLACED BY:		



TITLE: PRINTED CIRCUIT 11.0651 B		MODEL: PAM1360E/960E/560E/360E	ECLER — LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 8 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0267 V — REV. B
CHECKED:	DATE:	REPLACED BY:	

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM1360E	DRW.Nº 33.0266B and 267B PL	REPLACES:
DATE: 001106	SHEET 1 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
C101	100n	FCXCN41000
C102	C22p	FCXCN12200
C103	47µ/100	FCCE350470
C104	C47p	FCXCN14700
C105	C47p	FCXCN14700
C106	47µ/50	FCCE250470
C107	10µ/35	FCCE250100
C108	C15p	FCXCN11500
C109	100n	FCXCN41000
C110	47µ/100	FCCE350470
C111	10µ/35	FCCE250100
C112	10µ/35	FCCE250100
C113	470n	FCXCN44700
C114	470n	FCXCN44700
C115	47µ/100	FCCE350470
C116	220n/100	FCCDK52200
C117	47µ/100	FCCE350470
C118	220n/100	FCCDK52200
C119	10n	FCXCN40100
C120	10n	FCXCN40100
C121	100n/400	FCCDH71100
C122	47n/400	FCCDH71047
C123	100n	FCXCN41000
C124	100n	FCXCN41000
C125	100n	FCXCN41000
C126	100n	FCXCN41000
C127	C12p	FCXCN11200
C128	C12p	FCXCN11200
D101	Z3.9	FCXZ000039
D102	Z3.9	FCXZ000039
D103	Z12	FCDD041200
D104	Z12	FCDD041200
D105	Z12	FCDD041200
D106	Z12	FCDD041200
D107	Z12	FCDD041200
D108	Z12	FCDD041200
D109	Z12	FCDD041200
D110	Z12	FCDD041200
D111	Z12	FCDD041200
D112	Z12	FCDD041200
D113	Z12	FCDD041200
D114	Z12	FCDD041200
D115	Z62/1	FCDD106200
D116	Z62/1	FCDD106200
D117	Z27/1	FCDD102700
D118	Z27/1	FCDD102700
D119	Z33/1	FCDD103300
D120	Z27/1	FCDD102700
D121	Z27/1	FCDD102700
D122	Z33/1	FCDD103300
D123	BAS28	FCXDDBAS28
D124	BAS28	FCXDDBAS28
D125	Z10	FCXZ000100
F101	T 12A	FCFUS50400
F102	T 12A	FCFUS50400
H101	VTL5C8	FCOPTUTL50
IC101	LM35D	FCIC350000
IC102	TL071	FCIC071010

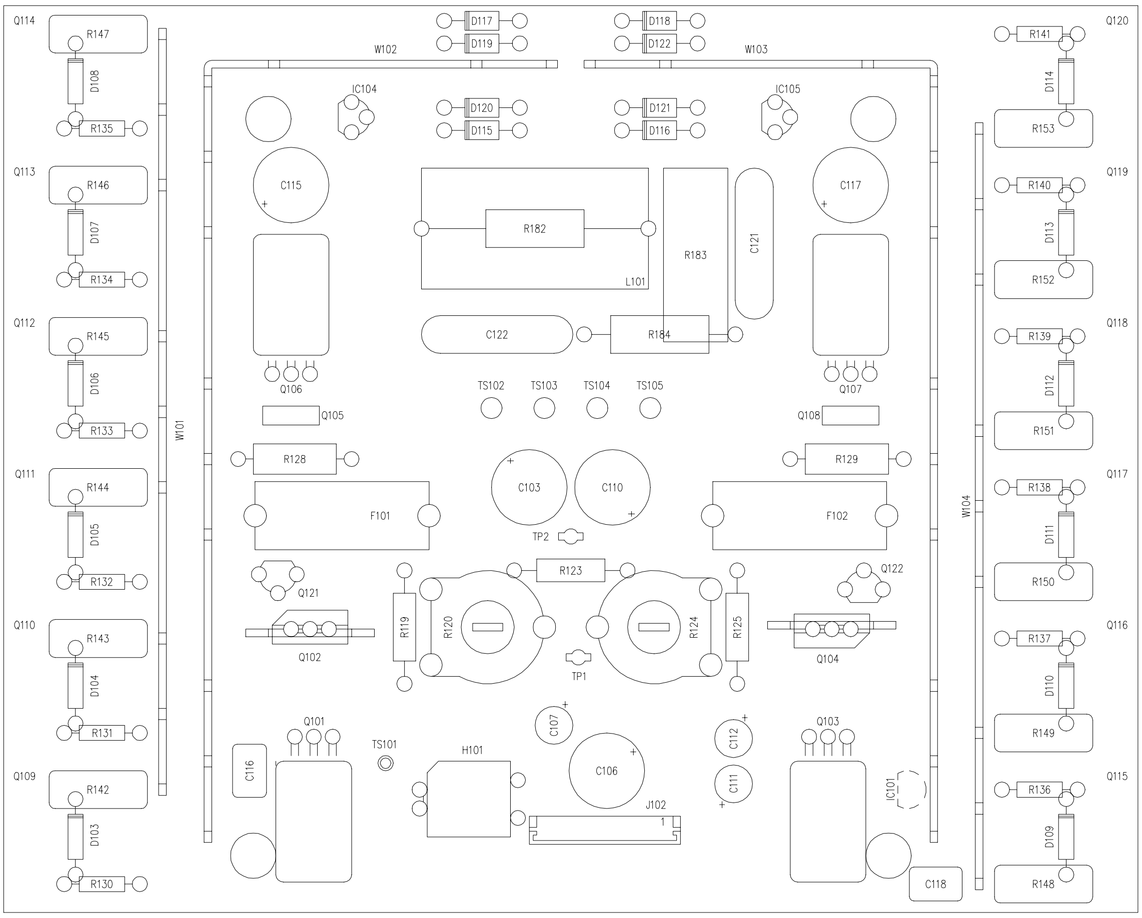
REFERENCE	VALUE	CODE
IC103	NE5534A	FCIC553410
IC104	TL431A	FCIC431000
IC105	TL431A	FCIC431000
J102	B7B-EH-A	FCCTM00070
L101	1µH	FCIND00100
Q101	BD437	FCTR437000
Q102	BF871	FCTR871000
Q103	BD437	FCTR437000
Q104	BF872	FCTR872000
Q105	MJE340	FCTR340000
Q106	MJE350	FCTR350000
Q107	MJE340	FCTR340000
Q108	MJE350	FCTR350000
Q109	IRFP9240	FCTR243000
Q110	IRFP9240	FCTR243000
Q111	IRFP9240	FCTR243000
Q112	IRFP9240	FCTR243000
Q113	IRFP9240	FCTR243000
Q114	IRFP9240	FCTR243000
Q115	IRFP240	FCTR240000
Q116	IRFP240	FCTR240000
Q117	IRFP240	FCTR240000
Q118	IRFP240	FCTR240000
Q119	IRFP240	FCTR240000
Q120	IRFP240	FCTR240000
Q121	BC557B	FCTR557500
Q122	BC547B	FCTR547500
Q123	BC857B	FCXTT08570
Q124	BC847B	FCXTT08470
Q125	BC857B	FCXTT08570
Q126	BC847B	FCXTT08470
Q127	BC857B	FCXTT08570
Q128	BC847B	FCXTT08470
Q129	BC857B	FCXTT08570
Q130	BC847B	FCXTT08470
R101	680k	FCXR056800
R102	22k	FCXR042200
R103	100k	FCXR051000
R104	22k	FCXR042200
R105	22k	FCXR042200
R106	1k82	FCXR131820
R107	1k	FCXR031000
R108	1k5	FCXR031500
R109	MF1k	FCXR131000
R110	MF47k5	FCXR144750
R111	680k	FCXR056800
R112	MF51k1	FCXR145110
R113	MF1k21	FCXR131210
R114	MF487 Ohms	FCXR124870
R115	MF191 Ohms	FCXR121910
R116	MF487 Ohms	FCXR124870
R117	MF191 Ohms	FCXR121910
R118	MF1k21	FCXR131210
R119	390 Ohms / 1/2W	FCRF23390
R120	Adjustable 500 Ohms	FCRJP35000
R121	1k5	FCXR031500
R122	1k5	FCXR031500
R123	1k5/ 1/2W	FCRC241500

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM1360E	DRW.Nº 33.0266B and 267B PL	REPLACES:
DATE: 001106	SHEET 3 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
R124	Adjustable 5k	FCRJP44700
R125	680 Ohms / 1/2W	FCRF236800
R126	10 Ohms	FCXR011000
R127	10 Ohms	FCXR011000
R128	NF120 Ohms / 1W	FCRF431200
R129	NF120 Ohms / 1W	FCRF431200
R130	NF330 Ohms	FCRF233300
R131	NF330 Ohms	FCRF233300
R132	NF330 Ohms	FCRF233300
R133	NF330 Ohms	FCRF233300
R134	NF330 Ohms	FCRF233300
R135	NF330 Ohms	FCRF233300
R136	NF330 Ohms	FCRF233300
R137	NF330 Ohms	FCRF233300
R138	NF330 Ohms	FCRF233300
R139	NF330 Ohms	FCRF233300
R140	NF330 Ohms	FCRF233300
R141	NF330 Ohms	FCRF233300
R142	W0.22 Ohms / 5W	FCRY000100
R143	W0.22 Ohms / 5W	FCRY000100
R144	W0.22 Ohms / 5W	FCRY000100
R145	W0.22 Ohms / 5W	FCRY000100
R146	W0.22 Ohms / 5W	FCRY000100
R147	W0.22 Ohms / 5W	FCRY000100
R148	W0.22 Ohms / 5W	FCRY000100
R149	W0.22 Ohms / 5W	FCRY000100
R150	W0.22 Ohms / 5W	FCRY000100
R151	W0.22 Ohms / 5W	FCRY000100
R152	W0.22 Ohms / 5W	FCRY000100
R153	W0.22 Ohms / 5W	FCRY000100
R154	MF178 Ohms	FCXR121780
R155	MF2k21	FCXR132210
R156	10k	FCXR041000
R157	10k	FCXR041000
R158	10k	FCXR041000
R159	10k	FCXR041000
R160	MF178	FCXR121780
R161	MF2k21	FCXR132210
R162	2k2	FCXR032200
R163	10k	FCXR041000
R164	10k	FCXR041000
R165	2k2	FCXR032200
R166	33k	FCXR043300
R167	33k	FCXR043300
R168	MF215 Ohms	FCXR122150
R169	MF215 Ohms	FCXR122150
R170	2k2	FCXR032200
R171	10k	FCXR041000
R172	10k	FCXR041000
R173	2k2	FCXR032200
R174	33k	FCXR043300
R175	33k	FCXR043300
R176	MF487 Ohms	FCXR124870
R177	MF487 Ohms	FCXR124870
R178	MF205 Ohms	FCXR122050
R179	MF205 Ohms	FCXR122050
R180	MF205 Ohms	FCXR122050
R181	MF205 Ohms	FCXR122050

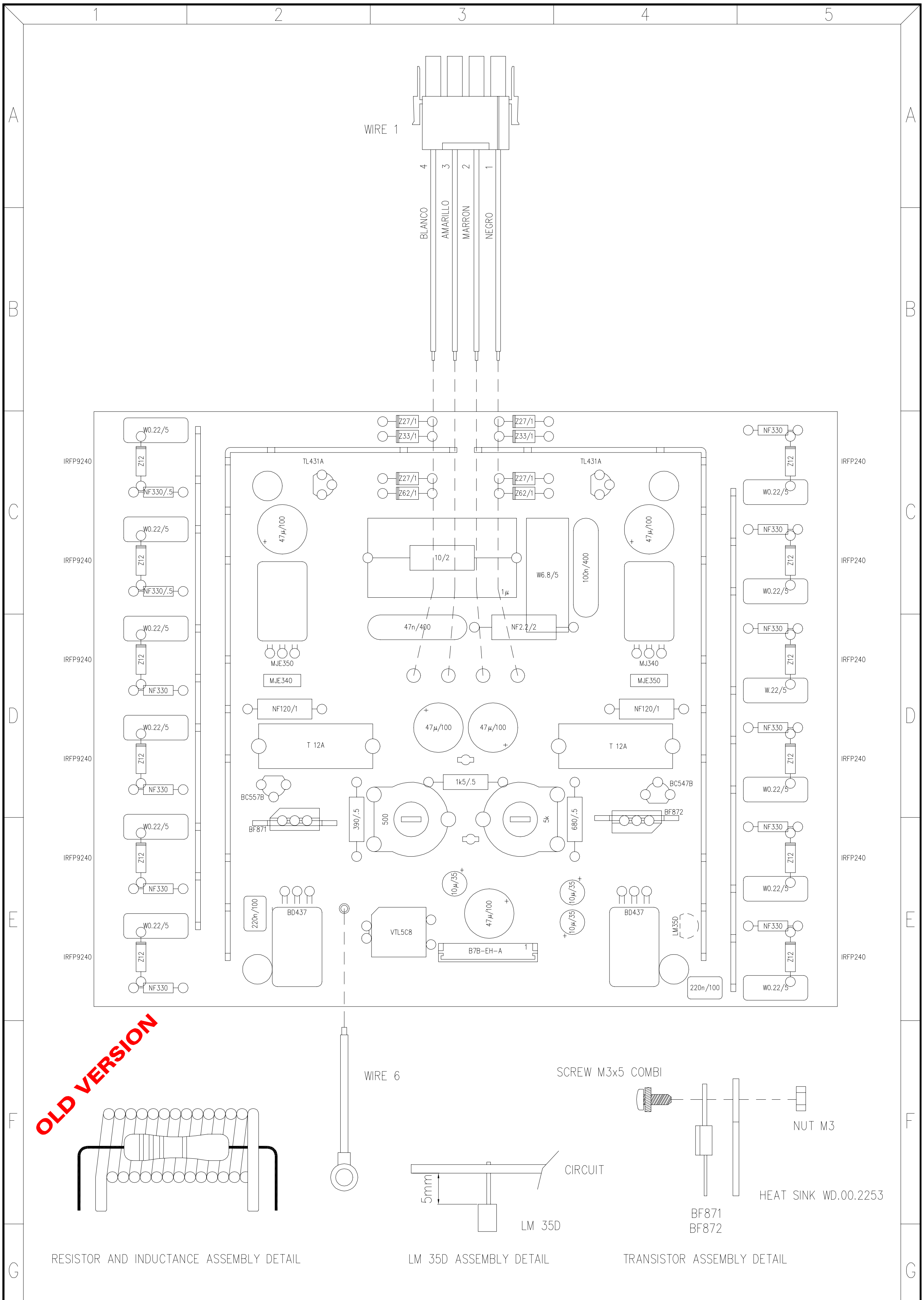
PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM1360E	DRW.Nº 33.0266B and 267B PL	REPLACES:
DATE: 001109	SHEET 4 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
R182	10 Ohms / 2W	FCRC521000
R183	W6.8 Ohms / 5W	FCRY000250
R184	NF2.2 Ohms / 2W	FCRC512200
R185	75 Ohms	FCXR017500
R186	75 Ohms	FCXR017500
TP1	Test terminal	FCTERMF280
TP2	Test terminal	FCTERMF280
TS101	BLACK	WIRE 6
TS102/103/104/105	WHITE/YELLOW/BROWN/BLACK	WIRE 1

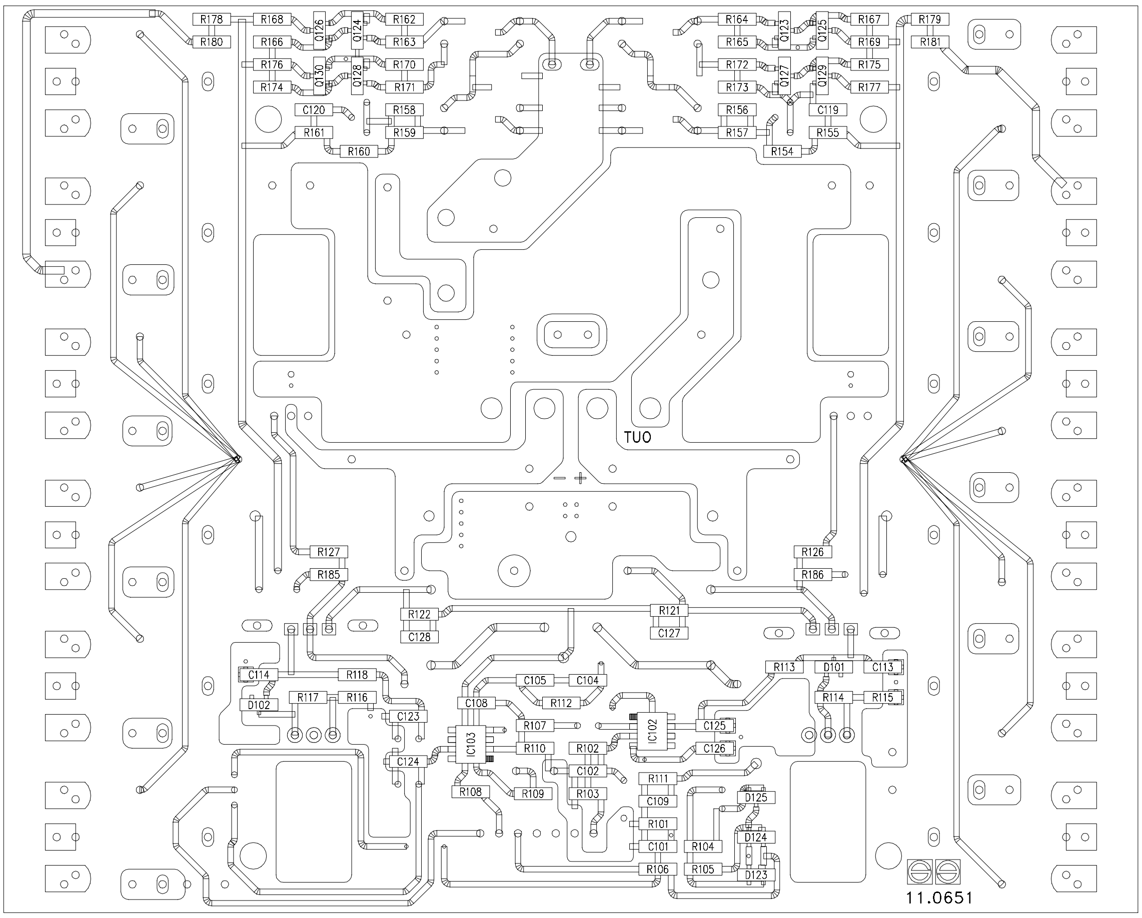


OLD VERSION

TITLE: PRINTED CIRCUIT 11.0651		MODEL: PAM1360 E	ECLER — LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 5 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0266 R
CHECKED:	DATE:	REPLACED BY:	REV.

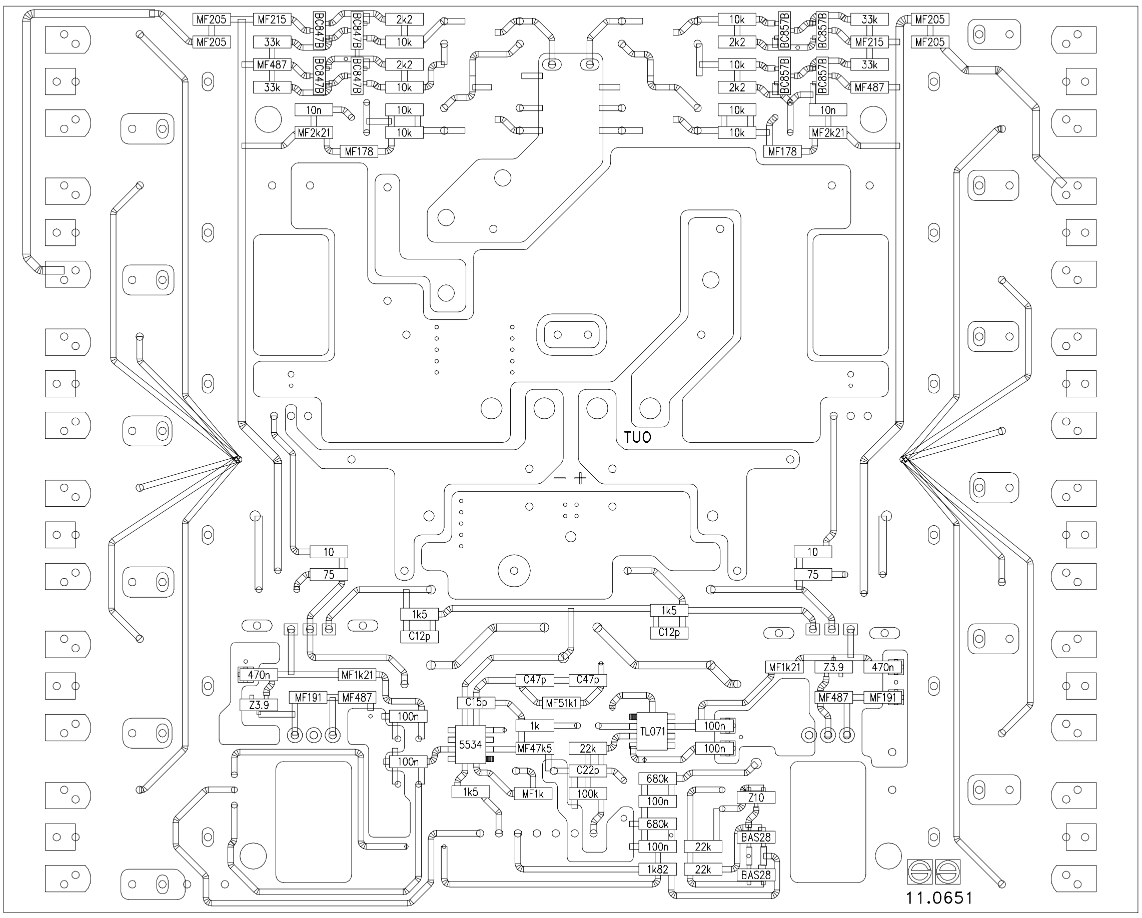


TITLE: PRINTED CIRCUIT 11.0651		MODEL: PAM1360 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 6 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0266 — REV. V
CHECKED:	DATE:	REPLACED BY:	



OLD VERSION

TITLE: PRINTED CIRCUIT 11.0651	MODEL: PAM1360 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
	SHEET 7 OF 14	
DRAWN: AMOROS/QUERALT — DATE: 10.02.98	REPLACES:	DRW. NO. 33.0267R — REV.
CHECKED: — DATE:	REPLACED BY:	



OLD VERSION

TITLE: PRINTED CIRCUIT 11.0651	MODEL: PAM1360 E
	SHEET 8 OF 14
DRAWN: AMOROS/QUERALT — DATE: 10.02.98	REPLACES:
CHECKED: — DATE:	REPLACED BY:

ECLER
LABORATORIO DE ELECTRO-ACUSTICA
BARCELONA ESPAÑA

DRW. NO. 33.0267 V
REV.

PARTS LIST: PRINTED CIRCUIT 11.0651 REV:
MODEL: PAM1360E DRW.Nº 33.0266 and 267PL REPLACES:
DATE: 10.02.98 SHEET 1 OF 4 REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
C101	100n	FCXCN41000
C102	C22p	FCXCN12200
C103	47µ/100	FCCE350470
C104	C47p	FCXCN14700
C105	C47p	FCXCN14700
C106	47µ/50	FCCE250470
C107	10µ/35	FCCE250100
C108	C15p	FCXCN11500
C109	100n	FCXCN41000
C110	47µ/100	FCCE350470
C111	10µ/35	FCCE250100
C112	10µ/35	FCCE250100
C113	470n	FCXCN44700
C114	470n	FCXCN44700
C115	47µ/100	FCCE350470
C116	220n/100	FCCDK52200
C117	47µ/100	FCCE350470
C118	220n/100	FCCDK52200
C119	10n	FCXCN40100
C120	10n	FCXCN40100
C121	100n/400	FCCDH71100
C122	47n/400	FCCDH71047
C123	100n	FCXCN41000
C124	100n	FCXCN41000
C125	100n	FCXCN41000
C126	100n	FCXCN41000
C127	C12p	FCXCN11200
C128	C12p	FCXCN11200
D101	Z3.9	FCXZ000039
D102	Z3.9	FCXZ000039
D103	Z12	FCDD041200
D104	Z12	FCDD041200
D105	Z12	FCDD041200
D106	Z12	FCDD041200
D107	Z12	FCDD041200
D108	Z12	FCDD041200
D109	Z12	FCDD041200
D110	Z12	FCDD041200
D111	Z12	FCDD041200
D112	Z12	FCDD041200
D113	Z12	FCDD041200
D114	Z12	FCDD041200
D115	Z62/1	FCDD106200
D116	Z62/1	FCDD106200
D117	Z27/1	FCDD102700
D118	Z27/1	FCDD102700
D119	Z33/1	FCDD103300
D120	Z27/1	FCDD102700
D121	Z27/1	FCDD102700
D122	Z33/1	FCDD103300
D123	BAS28	FCXDDBAS28
D124	BAS28	FCXDDBAS28
D125	Z10	FCXZ000100
F101	T 12A	FCFUS50400
F102	T 12A	FCFUS50400
H101	VTL5C8	FCOPTUTL50
IC101	LM35D	FCIC350000
IC102	TL071	FCIC071010

PARTS LIST: PRINTED CIRCUIT 11.0651 REV:
MODEL: PAM1360E DRW.Nº 33.0266 and 267PL REPLACES:
DATE: 10.02.98 SHEET 2 OF 4 REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
IC103	NE5534A	FCIC553410
IC104	TL431A	FCIC431000
IC105	TL431A	FCIC431000
J102	B7B-EH-A	FCCTM00070
L101	1μH	FCIND00100
Q101	BD437	FCTR437000
Q102	BF871	FCTR871000
Q103	BD437	FCTR437000
Q104	BF872	FCTR872000
Q105	MJE340	FCTR340000
Q106	MJE350	FCTR350000
Q107	MJE340	FCTR340000
Q108	MJE350	FCTR350000
Q109	IRFP9240	FCTR243000
Q110	IRFP9240	FCTR243000
Q111	IRFP9240	FCTR243000
Q112	IRFP9240	FCTR243000
Q113	IRFP9240	FCTR243000
Q114	IRFP9240	FCTR243000
Q115	IRFP240	FCTR240000
Q116	IRFP240	FCTR240000
Q117	IRFP240	FCTR240000
Q118	IRFP240	FCTR240000
Q119	IRFP240	FCTR240000
Q120	IRFP240	FCTR240000
Q121	BC557B	FCTR557500
Q122	BC547B	FCTR547500
Q123	BC857B	FCXTT08570
Q124	BC847B	FCXTT08470
Q125	BC857B	FCXTT08570
Q126	BC847B	FCXTT08470
Q127	BC857B	FCXTT08570
Q128	BC847B	FCXTT08470
Q129	BC857B	FCXTT08570
Q130	BC847B	FCXTT08470
R101	680k	FCXR056800
R102	22k	FCXR042200
R103	100k	FCXR051000
R104	22k	FCXR042200
R105	22k	FCXR042200
R106	1k82	FCXR131820
R107	1k	FCXR031000
R108	1k5	FCXR031500
R109	MF1k	FCXR131000
R110	MF47k5	FCXR144750
R111	680k	FCXR056800
R112	MF51k1	FCXR145110
R113	MF1k21	FCXR131210
R114	MF487 Ohms	FCXR124870
R115	MF191 Ohms	FCXR121910
R116	MF487 Ohms	FCXR124870
R117	MF191 Ohms	FCXR121910
R118	MF1k21	FCXR131210
R119	390 Ohms / 1/2W	FCRF23390
R120	Adjustable 500 Ohms	FCRJP35000
R121	1k5	FCXR031500
R122	1k5	FCXR031500
R123	1k5/ 1/2W	FCRC241500

PARTS LIST: PRINTED CIRCUIT 11.0651 REV:
MODEL: PAM1360E DRW.Nº 33.0266 and 267PL REPLACES:
DATE: 10.02.98 SHEET 3 OF 4 REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
R124	Adjustable 5k	FCRJP44700
R125	680 Ohms / 1/2W	FCRF236800
R126	10 Ohms	FCXR011000
R127	10 Ohms	FCXR011000
R128	NF120 Ohms / 1W	FCRF431200
R129	NF120 Ohms / 1W	FCRF431200
R130	NF330 Ohms	FCRF233300
R131	NF330 Ohms	FCRF233300
R132	NF330 Ohms	FCRF233300
R133	NF330 Ohms	FCRF233300
R134	NF330 Ohms	FCRF233300
R135	NF330 Ohms	FCRF233300
R136	NF330 Ohms	FCRF233300
R137	NF330 Ohms	FCRF233300
R138	NF330 Ohms	FCRF233300
R139	NF330 Ohms	FCRF233300
R140	NF330 Ohms	FCRF233300
R141	NF330 Ohms	FCRF233300
R142	W0.22 Ohms / 5W	FCRY000100
R143	W0.22 Ohms / 5W	FCRY000100
R144	W0.22 Ohms / 5W	FCRY000100
R145	W0.22 Ohms / 5W	FCRY000100
R146	W0.22 Ohms / 5W	FCRY000100
R147	W0.22 Ohms / 5W	FCRY000100
R148	W0.22 Ohms / 5W	FCRY000100
R149	W0.22 Ohms / 5W	FCRY000100
R150	W0.22 Ohms / 5W	FCRY000100
R151	W0.22 Ohms / 5W	FCRY000100
R152	W0.22 Ohms / 5W	FCRY000100
R153	W0.22 Ohms / 5W	FCRY000100
R154	MF178 Ohms	FCXR121780
R155	MF2k21	FCXR132210
R156	10k	FCXR041000
R157	10k	FCXR041000
R158	10k	FCXR041000
R159	10k	FCXR041000
R160	MF178	FCXR121780
R161	MF2k21	FCXR132210
R162	2k2	FCXR032200
R163	10k	FCXR041000
R164	10k	FCXR041000
R165	2k2	FCXR032200
R166	33k	FCXR043300
R167	33k	FCXR043300
R168	MF215 Ohms	FCXR122150
R169	MF215 Ohms	FCXR122150
R170	2k2	FCXR032200
R171	10k	FCXR041000
R172	10k	FCXR041000
R173	2k2	FCXR032200
R174	33k	FCXR043300
R175	33k	FCXR043300
R176	MF487 Ohms	FCXR124870
R177	MF487 Ohms	FCXR124870
R178	MF205 Ohms	FCXR122050
R179	MF205 Ohms	FCXR122050
R180	MF205 Ohms	FCXR122050
R181	MF205 Ohms	FCXR122050

PARTS LIST: | PRINTED CIRCUIT 11.0651 | REV:
MODEL: PAM1360E | DRW.Nº 33.0266 and 267PL | REPLACES:
DATE: 10.02.98 | SHEET 4 OF 4 | REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
R182	10 Ohms / 2W	FCRC521000
R183	W6.8 Ohms / 5W	FCRY000200
R184	NF2.2 Ohms / 2W	FCRC512200
R185	75 Ohms	FCXR017500
R186	75 Ohms	FCXR017500
TP1	Test terminal	FCTERMSOL0
TP2	Test terminal	FCTERMSOL0
TS101	BLACK	WIRE 6
TS102/103/104/105	WHITE/YELLOW/BROWN/BLACK	WIRE 1

PAM 1360/960/560/360E - TESTING RULES

PRELIMINARY:

Check that there is no shortcircuit between ground and the chassis, wiht the wires of the modules are disconnected from the source of power.

Put the power amplifier in stereo mode. We will need, at least, a 1500VA variac for our tests.

Connect an ammeter (10A DC scale) in place of one of the fuses of the module in which the tests will be made. Put the oscilloscope probe between TP-GND.

SETUP

Unplug the fuses of the module that we are NOT setting up. Connect the power amplifier mains cable to the output of the variac. Set the variac output at 0V.

Switch the power amplifier on,with no load or signal. Turn the variac up progressively step by step until you reach 230V. Make sure the module's current does never exceed 0.8A. Once the circuit is stable make sure the current is 420mA/350mA/210mA/140mA (PAM1360E/PAM960E/PAM560E/PAM360E) and the symmetry (measured up with the oscilloscope probe) is ≤50mV. If necessary, adjust CURRENT (5K) and SYMMETRY (470Ω) untill you get the above mentioned values.

Test the operational amplifier power supply (±18V) ±1V.

Put the fuse back into the module (with the power amplifier turned off) and repeat the same procedure for the other channel.

CROSS DISTORTION:

Introduce, by means of a signal generator, a level of 100mV RMS at 1kHz and check there is no cross distortion at the amplifier output (attenuators at 0dB position).

MOSFETS CONDUCTION:

By using a signal generator introduce a level of 0.5V at 1kHz and load the amplifier with 4Ω. Check that all MOSFETs are conducting approximately the same current level (measure this current with the oscilloscope probe by placing it on the 0,22Ω source resistances). The maximum conduction difference between MOSFETs should be ±100mV. When making this test be sure the oscilloscope ground is not connected to any other place of the circuit when making the reading; only to the 0,22Ω resistance. Else you could produce a shortcircuit between two points of the circuit and therefore a very important damage.

POWER:

Verify the amplifier's power at 8 and 4Ω.
Maintain the mains voltage at 230V by means of the variac.
Check that the following is true at close-to-clip point:

		PAM1360E	PAM 960E	PAM 560E	PAM 360E
Vin≈1VRMS/ Vo 4Ω	≥	50.5V RMS	42.0V RMS	32.0V RMS	26.5V RMS
Vin≈1VRMS/ Vo 8Ω	≥	56.8V RMS	46.0V RMS	37.0V RMS	30.5V RMS

FREQUENCY RESPONSE:

0.5V input signal. Verify frequency response at 20Hz/2kHz/20kHz. We must get the same signal output for the actual load at any of these frequencies. Set the frequency at 50kHz; the output level, should not decrease more than 1 or 2 dB and there should not be any noticeable distortion.

SUBSONIC FILTER

Check the subsonic filter. With a frequency of 25Hz, on pressing the corresponding button the output level should go down 3dB in relation to the previous level.

CLIPPING AT 1KHz:

Introduce such a signal that the amplifier is just about to clip.
Measure the voltage up at the output (over the load) and check that when the voltage decreases between 0.5 and 1 dB the clipping LEDs stop lighting. Check that each LED corresponds to its fader.

ANTICLIP

Check the anticlip, on pressing the button it practically stops cutting the signal.

DC OUT:

For this test you must disconnect the load from the amplifier.
Introduce a 1V signal at < 5Hz with the generator. Turn the output of the generator up untill the protection relays open and close.

MONO-STEREO:

Make this test with a load of 8Ω connected between left and right channels' red terminals.

Set the MONO-STEREO switch at MONO. Verify that the fader of channel 1 is operating while the one from channel 2 is NOT operating. Check the signal cut over the load is clean. Set the amplifier back to STEREO mode.

PROTECTIONS:

Disconnect one of the cables which are usually plugged to the thermals and check that the THERMAL LED is lighting up and the relay opens its contacts. Plug a functions generator connected to the amplifier input,select 1V RMS scale, leave the amplitude control at its minimum and leave at the OFF position. Connect a load of 0,5Ω/200W. Make sure we have a mains voltage of 230V. Connect the oscilloscope in parallel with the load (5V/div. scale). Set the generator at the ON position and slowly turn the amplitude up while checking, at the same time, that the output voltage is limited in both the positive and negative half-cycles between:

PAM1360E: ±6V and ± 20V peak.
PAM 960E: ±10V and ±16V peak.
PAM 560E: ± 10V and ±17V peak.
PAM 360E: ± 6V and ± 12V peak.

This voltage jump will happen as we apply more signal to the input through the generator's level control and it shows the transition from the B Zone to the C Zone in the figure we saw before about the theory of the protections operation. When you perform this measure you must also control the mains voltage by means of the variac, reducing it if necessary to be able to cleanly watch the jump from one level to the next.

In order to work in the A Zone we will use a load of 0,22Ω/80W. Before connecting the load, set the generator at the OFF position and select the 300mV RMS scale, leaving the amplitude control at its minimum. Load the amplifier output with 0,22Ω and connect the oscilloscope probe in parallel with it. Connect the generator and slowly turn the amplitude up while verifying that the signal over the load is not higher than:

PAM136E: ±2V peak.
PAM 960: ±3.5V peak.
PAM 560: ±2V peak.
PAM 360: ±1.5V peak.

If there is a level jump happening when we increase the input signal, this can be the transition point from the A Zone to the B Zone. Change a little bit the variac voltage, slowly increasing it untill the signal cut is clean and inside the indicated values.

PAM1360/960/560/360E QUALITY CONTROL

We will use a mixer with unbalanced output and a nominal output level of 1V RMS as the signal source for our tests.

Connect the mixer outputs to the power amplifier inputs. Plug the power amplifier to mains (check that its specified voltage matches that of mains) and make sure that CLIP/PROTECT and the power switch LEDs all light up when turning on the amplifier and there is a STANDBY time in the relay closing action. Turn up the amplifier output level untill the CLIP LEDs light up. Turn the output level back down and plug the loudspeakers.

Check the sound quality (no distorsions or noises). Check faders action (fader travel, signal cut at their low end, no scratching or clicking noises and correct stereo channel matching for each one). Check switchs action (mode STEREO-MONO, SUBSONIC 25Hz, ANTICLIP 2%).

Make sure the cooling fan is operating correctly. While the power amplifier is working shake it or throw it on a table to make sure the output sound goes on playing correctly. Shortcircuit the power amplifier output and check it goes back to normal operation when you stop shorcircuiting. Repeat the same procedure for the other channel.

TECHNICAL CHARACTERISTICS

Output power	PAM 360E	PAM 560E	PAM 960E	PAM 1360E
(Watt RMS, 1kHz 1% THD)				
4 Ohm Stereo*	185W	277W	444W	638W
8 Ohm Stereo*	128W	181W	277W	404W
8 Ohm Mono	370W	554W	888W	1275W
16 Ohm Mono	256W	362W	554W	808W
(Watt RMS, 20Hz-20kHz 0,1% THD)				
4 Ohm Stereo*	150W	228W	408W	588W
8 Ohm Stereo*	107W	154W	250W	383W
8 Ohm Mono	300W	456W	816W	1175W
16 Ohm Mono	215W	307W	498W	766W
* both channels driven				
Frequency response @ max output power(-1dB)	7Hz-50kHz	7Hz-50kHz	7Hz-50kHz	7Hz-50Kz
Intermodulation distortion (SMPTE) 50Hz and 7kHz@ 4:1 ratio, nominal power	<0,03%	<0,03%	<0,03%	<0,03%
TIM 100	<0,05%	<0,05%	<0,03%	<0,02%
Signal/noise ratio (20Hz-20kHz)				
ref. 1W/4Ω	>85dB	>80dB	>80dB	>80dB
ref. nominal power/4Ω	>107dB	>104dB	>107dB	>108dB
Damping factor @ 1kHz/8Ω	>300	>350	>400	>450
Slew Rate	±35V/ms	±51V/ms	±60V/ms	±70V/ms
Channel crosstalk @ 1kHz	>75dB	>75dB	>75dB	>75dB
Subsonic (a -3dB)			25Hz/18dB oct. Butterworth	
Anticlip			≈2% THD	
Input connector			XLR 3 balanced	
Sensitivity/impedance			0dBV(1V)/47kΩ	
CLIP indicators			-0,3dB real clip	

Protections

-Delayed turn-on heavy duty relay with PROTECT indicator ON during Stanby.

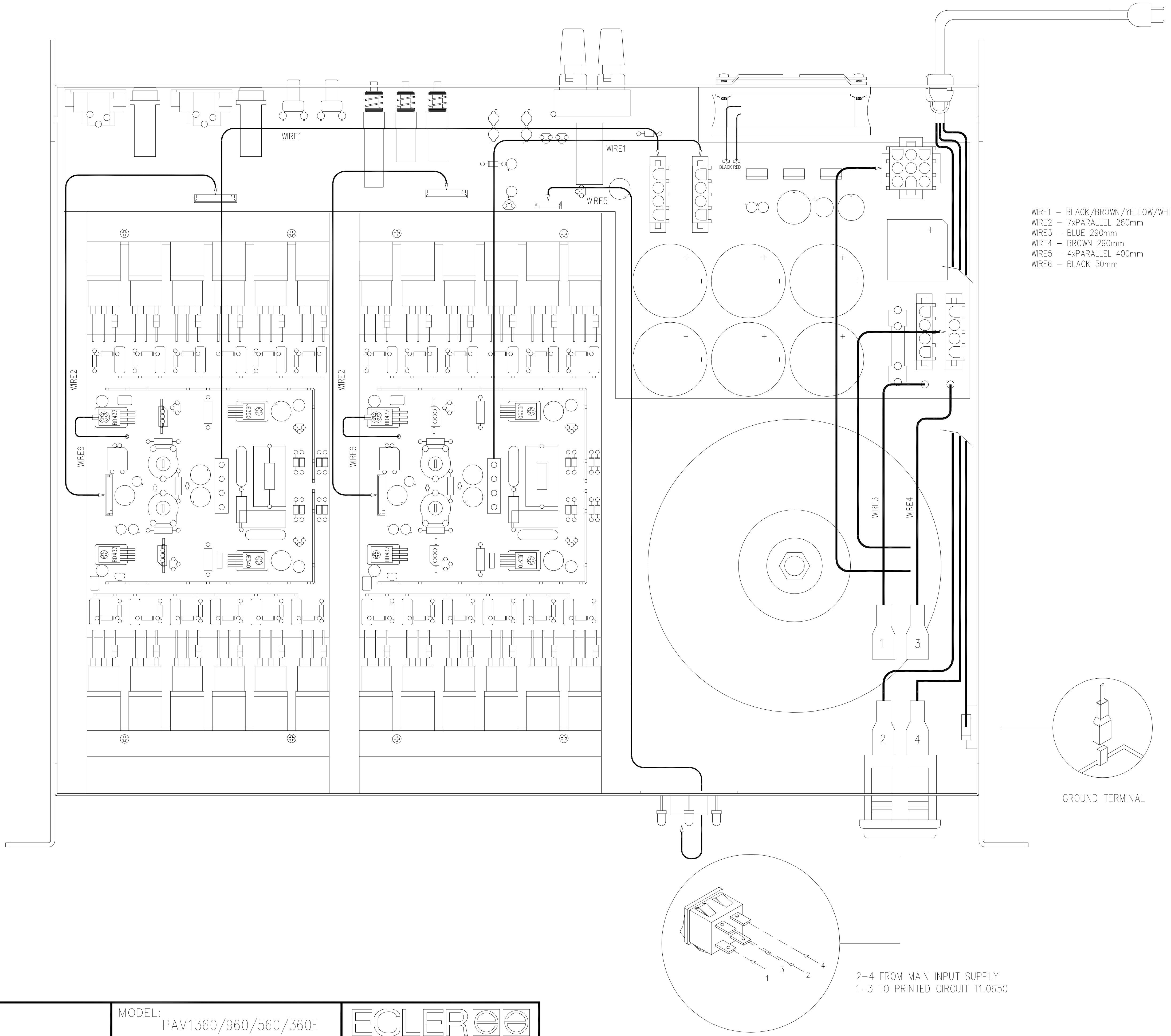
-DC: 4Hz or DC at 2V, PROTECT indicator.

-Thermal: A sensor activates a high temperature detection circuit, cutting the output to speaker, THERMAL indicator.

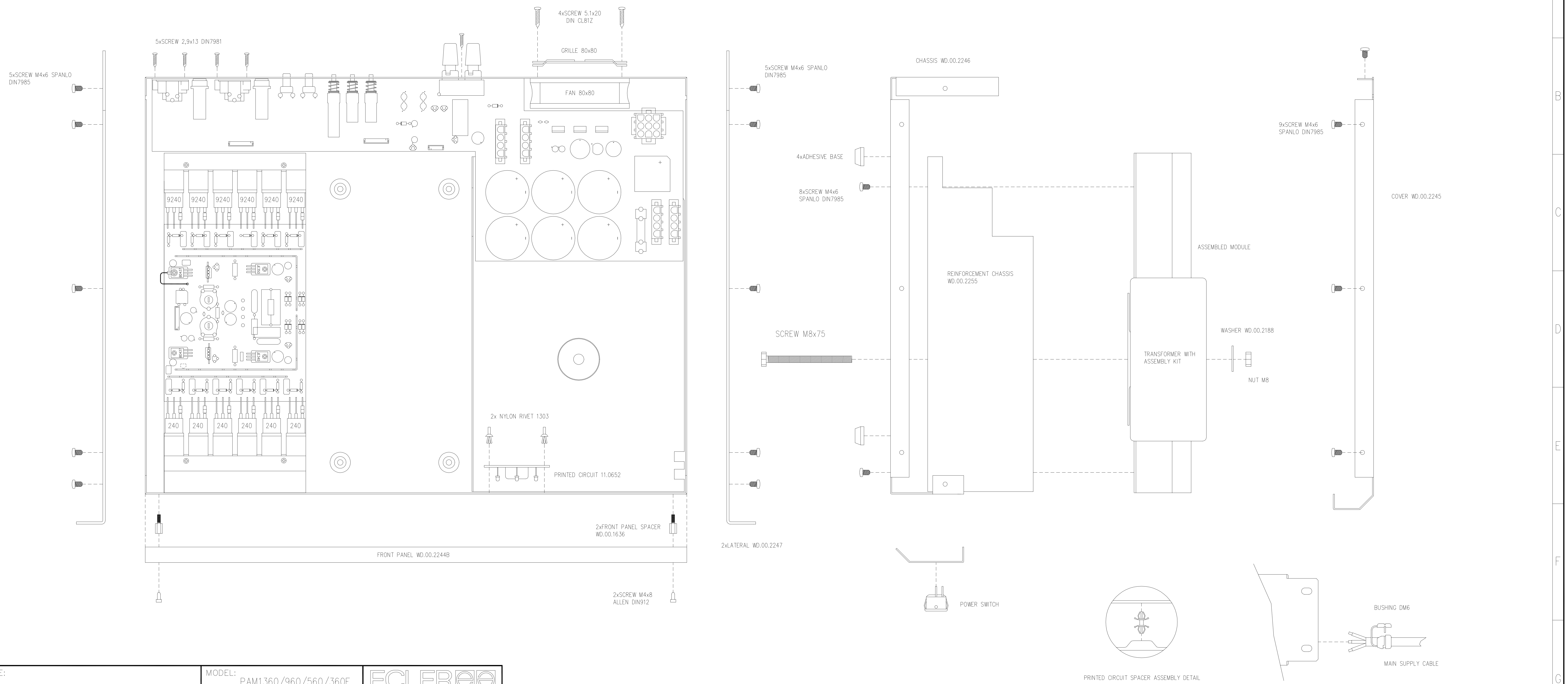
-Overload: Protection against output short circuit.

Mains Depending on your country. See characteristics in the back of the unit

	PAM 360E	PAM 560E	PAM 960E	PAM 1360E
Power consumption @ max. out. power/4Ω	570VA	830VA	1250VA	1790VA
Dimensions Front panel			482.6x88mm	
Dimensions Chassis			440x88x381mm	
Weight	12.6kg	13.5kg	14,5kg	16.5Kg



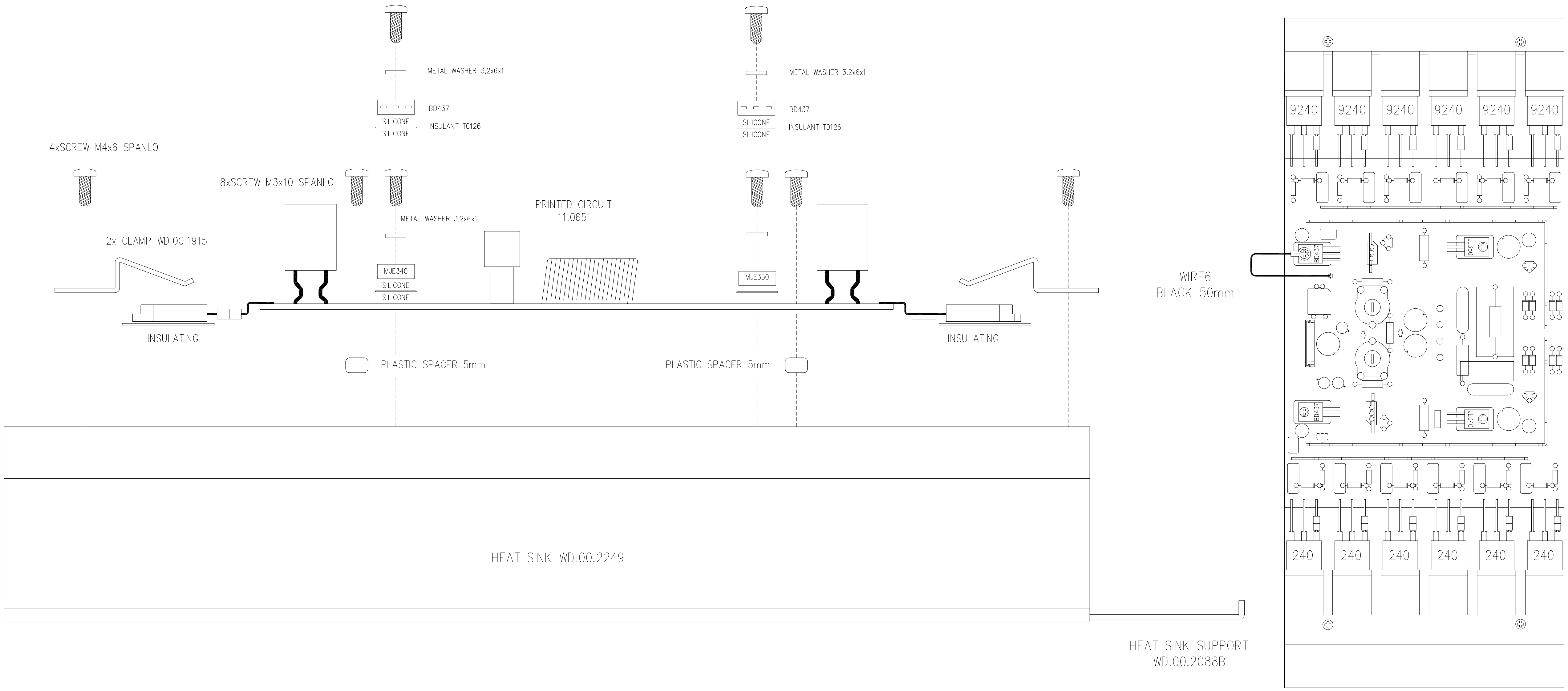
TITLE: WIRING DIAGRAM	MODEL: PAM1360/960/560/360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA	
	SHEET 1 OF 1		
DRAWN: J.QUERALT — DATE: 27.05.98	REPLACES:	DRW. NO. 31.0069	REV.
CHECKED: — DATE:	REPLACED BY:		



TITLE: MECHANICAL DIAGRAM	MODEL: PAM1360/960/560/360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA	
	SHEET 1 OF 2		
DRAWN: J.QUERALT / DATE: 28.05.98	REPLACES:	DRW. NO. 30.0087	REV.
CHECKED: / DATE:	REPLACED BY:		

PARTS LIST:	MECHANICAL DIAGRAM	REV:
MODEL:PAM1360/ 960/560/360E	DRW.Nº 30.0087PL	REPLACES:
DATE: 28.05.98	SHEET 1 OF 1	REPLACED BY:

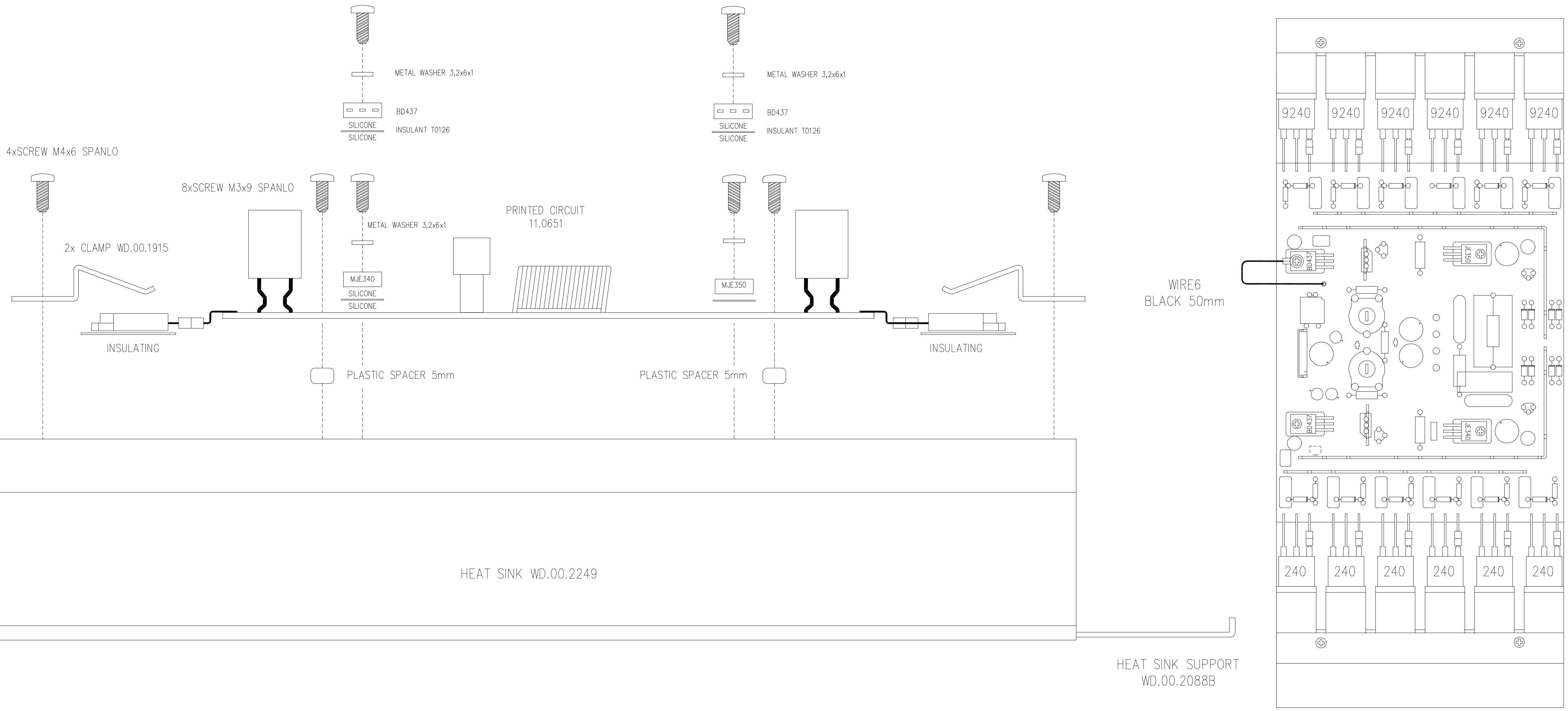
QUANTITY	VALUE	CODE
1	FRONT PANEL WD.00.2244	FCMECPAMI4
1	CHASSIS WD.002246	FCMECPAMI1
1	COVER WD.00.2245	FCMECPAMI5
1	REINFORCEMENT CHASSIS WD.00.2255	FCMECPAMI3
2	LATERAL WD.00.2247	FCMECPAMI2
1	FRON PANEL SPACER WD.00.1636	FCSEP07000
2	NYLON RIVET 1303	FCREM13030
1	POWER SWITCH	FCINTRED25
1	BUSHING DM6	FCPC00DM60
1	MAIN SUPPLY CABLE	FCCONX0150
2	PRINTED CIRCUIT SPACER	FCSEPWLS06
4	ADHESIVE BASE	FCPIE11255
1	FAN 80x80	FCVEN08000
1	GRILLE 80x80	FCREJ08000
1	WASHER WD.00.2188	FCMECARTRO
1	TRANSFORMER PAM1360E	FCTFT00480
1	TRANSFORMER PAM960E	FCTFT00470
1	TRANSFORMER PAM560E	FCTFT00460
1	TRANSFORMER PAM360E	FCTFT00450
27	SCREW M4x6 SPANLO DIN7985	FCT8040060
4	SCREW 5.1x20 DINCL81Z	FCT0605120
5	SCREW 2.9x13 DIN7981	FCT4002913
2	SCREW M4x8 ALLEN DIN912	FCTALL4080
1	ASSEMBLED PRINTED CIRCUIT 11.0650	
2	ASSEMBLED PRINTED CIRCUIT 11.0651 (with heat sink)	
1	ASSEMBLED PRINTED CIRCUIT 11.0652	



TITLE: MECHANICAL DIAGRAM	MODEL: PAM1360/969/560/360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
	SHEET 2 OF 2	
DRAWN: J.QUERALT — DATE: 28.05.98	REPLACES:	DRW. NO. 30.0086 — REV. A
CHECKED: — DATE:	REPLACED BY:	

PARTS LIST:	MECHANICAL DIAGRAM	REV:
MODEL:PAM1360/ 960/560/360E	DRW.Nº 30.0086 A PL	REPLACES:
DATE: 28.05.98	SHEET 1 OF 1	REPLACED BY:

QUANTITY	VALUE	CODE
1	HEAT SINK WD.00.2249	FCRAD13750
1	HEAT SINK SUPPORT WD.00.2088B	FCMECPAM65
2	CLAMP WD.00.1915	FCMECPQ398
4	INSULATING TO126	FCMICT0126
4	METAL WASHER 3.2x6x1	FCARM32010
4	PLASTIC SPACER 5mm	FCSEPPM000
2	TRANSISTOR BD437	FCTR437000
1	TRANSISTOR MJE350	FCTR350000
1	TRANSISTOR MJE340	FCTR340000
4	SCREW M4x6 SPANLO DIN7985	FCT8040060
8	SCREW M3x10 SPANLO	FCT8030100



OLD VERSION

TITLE: MECHANICAL DIAGRAM	MODEL: PAM1360/969/560/360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
	SHEET 2 OF 2	
DRAWN: J.QUERALT — DATE: 28.05.98	REPLACES:	DRW. NO. 30.0086 — REV.
CHECKED: — DATE:	REPLACED BY:	

PARTS LIST:	MECHANICAL DIAGRAM	REV:
MODEL:PAM1360/ 960/560/360E	DRW.Nº 30.0086PL	REPLACES:
DATE: 28.05.98	SHEET 1 OF 1	REPLACED BY:

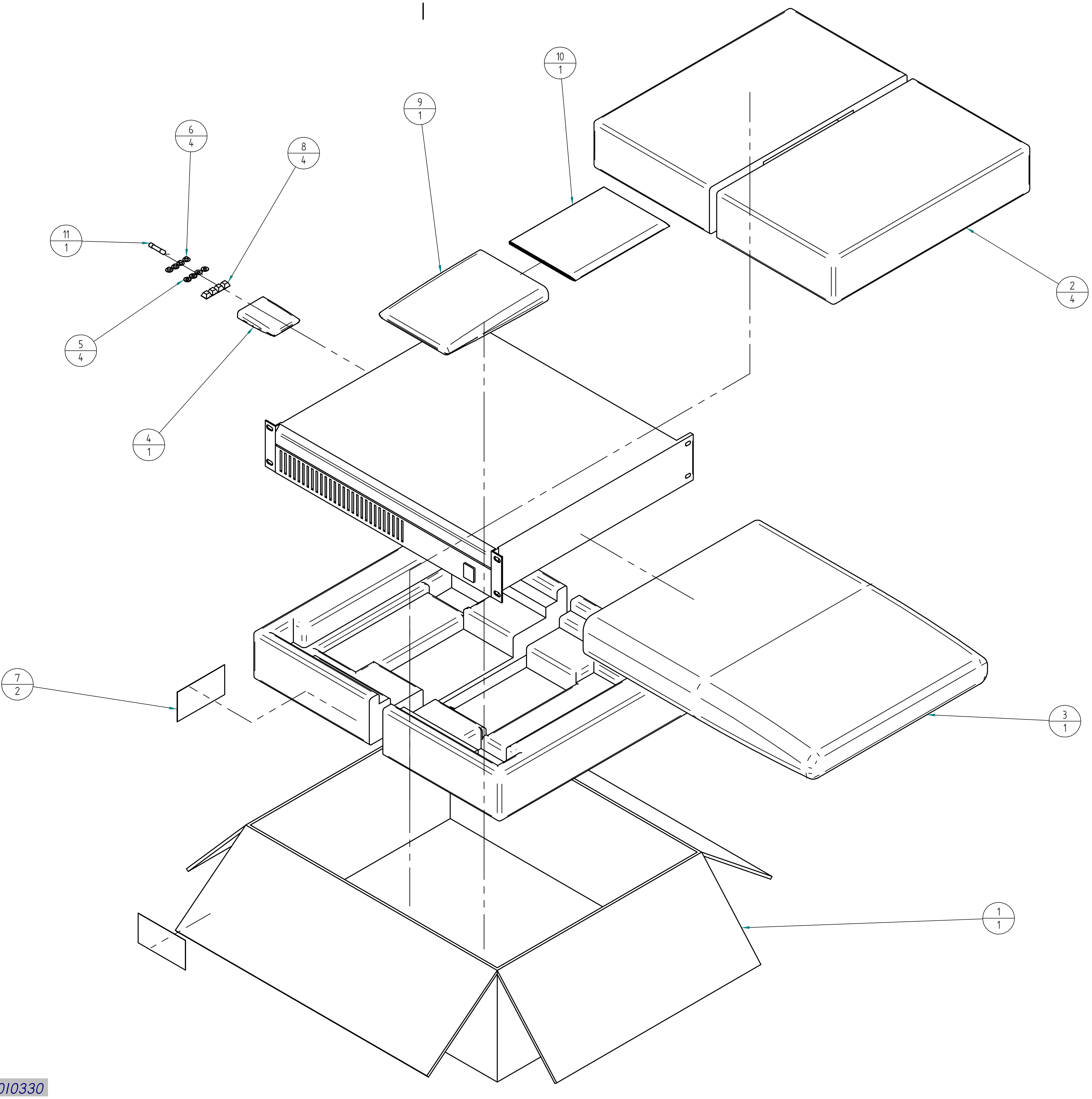
OLD VERSION

QUANTITY	VALUE	CODE
1	HEAT SINK WD.00.2249	FCRAD13750
1	HEAT SINK SUPPORT WD.00.2088B	FCMECPAM65
2	CLAMP WD.00.1915	FCMECPQ398
4	INSULATING TO126	FCMICT0126
4	METAL WASHER 3.2x6x1	FCARM32010
4	PLASTIC SPACER 5mm	FCSEPPM000
2	TRANSISTOR BD437	FCTR437000
1	TRANSISTOR MJE350	FCTR350000
1	TRANSISTOR MJE340	FCTR340000
4	SCREW M4x6 SPANLO DIN7985	FCT8040060
8	SCREW M3x9 SPANLO	FCT8030090

Nº	Qty	ECLER Code	Description
1	1	FCCAJSTA01	BOX STANDARD 1
2	4	FCCANT1180	INTERIOR REINFORCEMENT
3	1	FCBOLS0200	STANDARD BAG 75x65
4	1	FCBOL00100	BAG 60x80
5	4	FCARN50000	WASHER 5X11,5X0,8M
6	4	FCARAT3000	SCREW INSULATOR
7	2	FCETICAJA0	UNIT INFORMATION LABEL
8	4	FCPIE11255	RUBBER FOOT
9	1	FCFUNMAN00	USER MANUAL BAG
10	1	FCMANPAMK0	USER MANUAL PAM/E
11	1	GENERIC (*)	FUSE 6X32

(*) SPECIFIC FUSE TYPES:

- -PAM360E & PAM560E : FCFUS60500 FUSE 6,3A 6X32
- -PAM960E : FCFUS60100 FUSE 10A 6X32
- -PAM1360E : FCFUS60400 FUSE 16A 6X32



ECLER

drawn: Jordi Folch

date: 010330

approved:

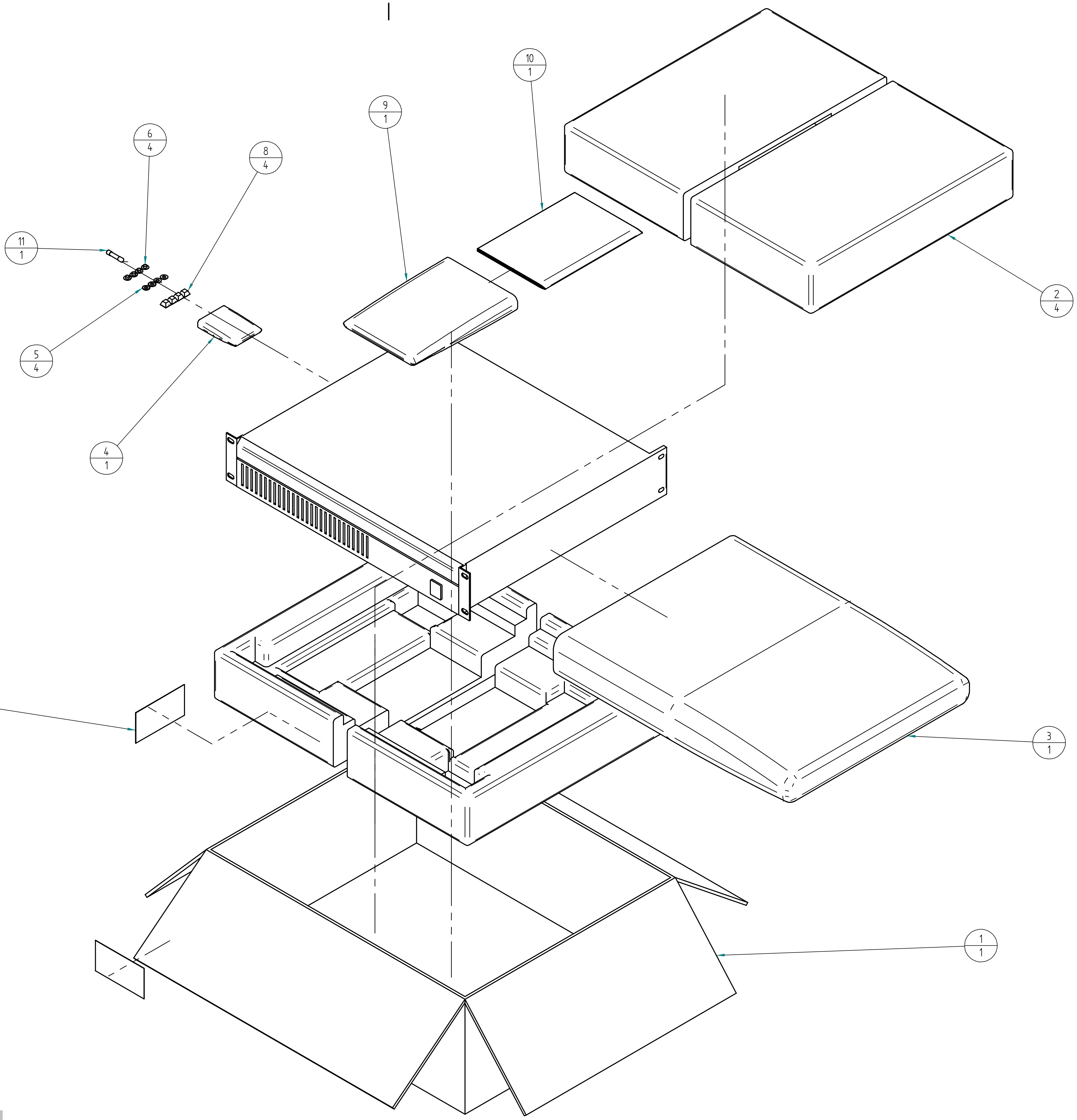
title: **PACKING DIAGRAM PAM / E**

number: 32.0031 version 02.01

Nº	Qty	ECLER Code	Description
1	1	FCCAJSTA01	BOX STANDARD 1
2	4	FCCANT1010	INTERIOR REINFORCEMENT
3	1	FCBOLS0200	STANDARD BAG 75x65
4	1	FCBOL00100	BAG 60x80
5	4	FCARN50000	WASHER 5X11,5X0,8M
6	4	FCARAT3000	SCREW INSULATOR
7	2	FCETICAJA0	UNIT INFORMATION LABEL
8	4	FCPIE11255	RUBBER FOOT
9	1	FCFUNMAN00	USER MANUAL BAG
10	1	FCMANPAMK0	USER MANUAL PAM/E
11	1	GENERIC (*)	FUSE 6X32

(*) SPECIFIC FUSE TYPES:

- -PAM360E & PAM560E : FCFUS60500 FUSE 6,3A 6X32
- -PAM960E : FCFUS60100 FUSE 10A 6X32
- -PAM1360E : FCFUS60400 FUSE 16A 6X32



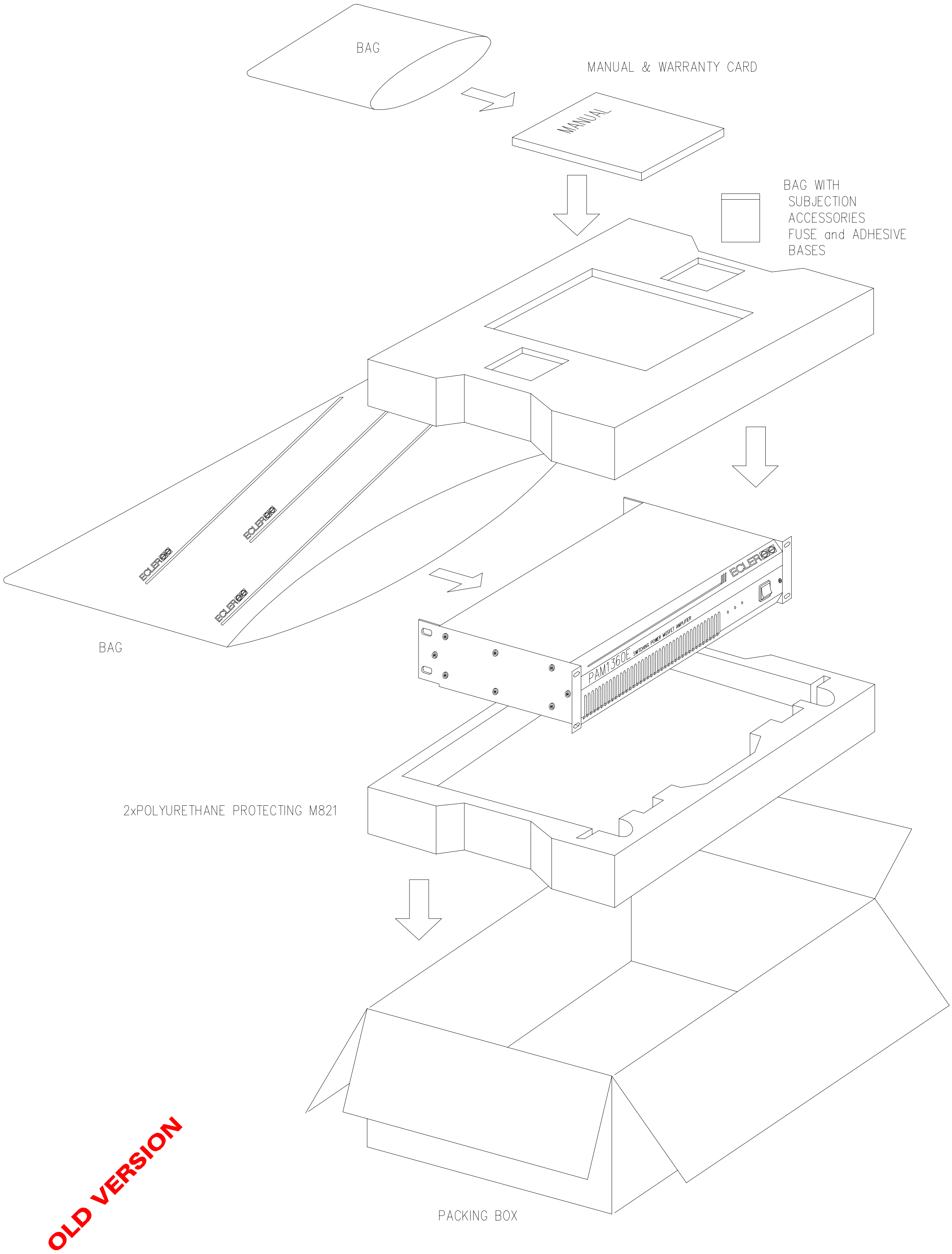
OLD VERSION

ECLER

drawn: Jordi Folch | date: 010330

approved: | title: **PACKING DIAGRAM PAM / E**

number: 32.0031 | version 02.00

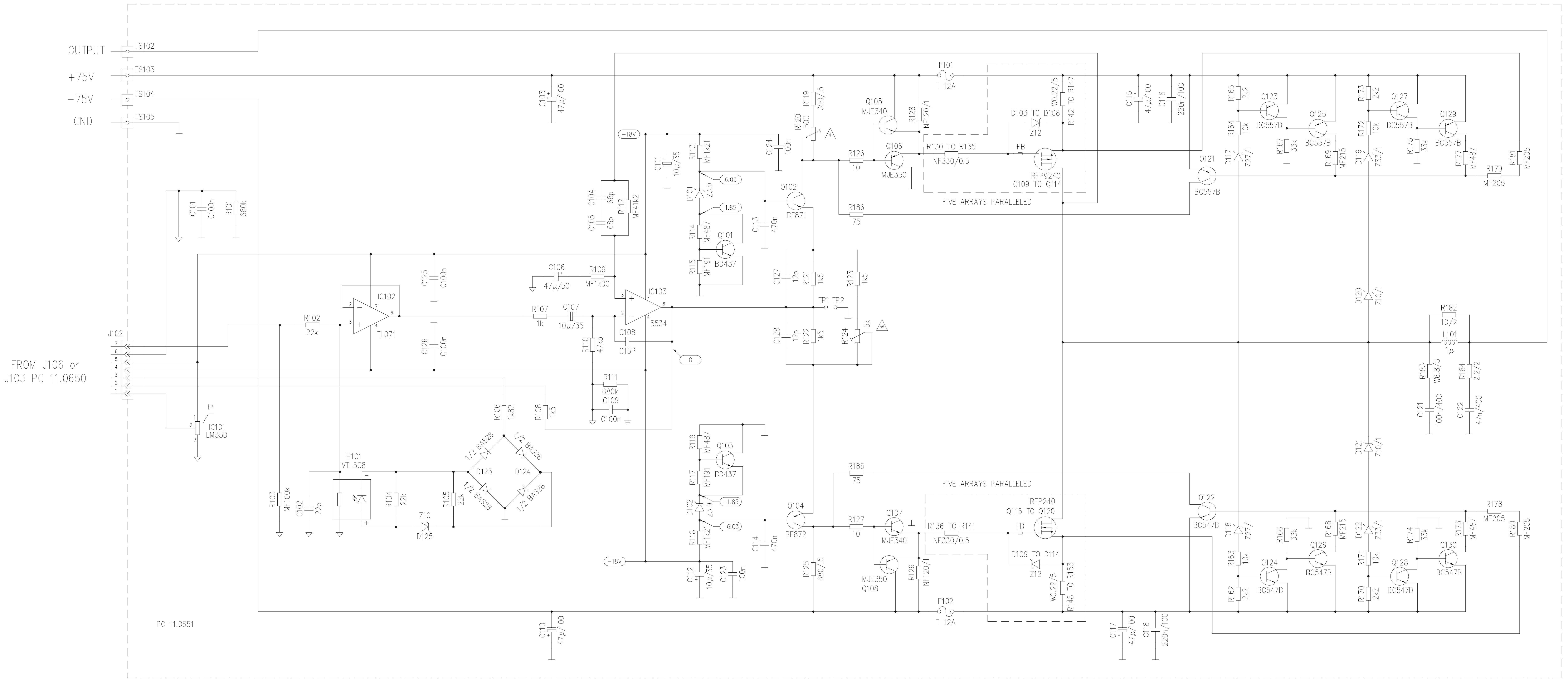


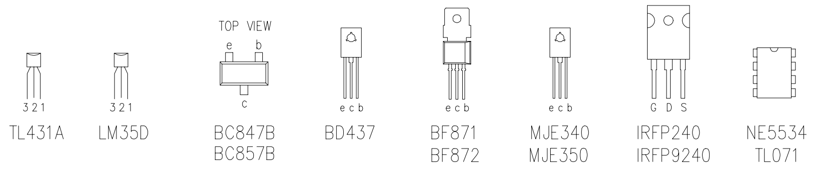
TITLE: PACKING DIAGRAM		MODEL: PAM1360/960/560/360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 1 OF 1	
DRAWN: J.QUERALT	DATE: 28.05.98	REPLACES:	DRW. NO. 32.0031
CHECKED:	DATE:	REPLACED BY:	REV.

PARTS LIST:	PACKING DIAGRAM	REV:
MODEL:PAM1360/960/560/360E	DRW.Nº 32.0031PL	REPLACES:
DATE: 28.05.98	SHEET 1 OF 1	REPLACED BY:

OLD VERSION

QUANTITY	VALUE	CODE
4	METAL WASHER 5x11.5x0.8	FCARN50000
4	WASHER AT 5x11.5x3.5 ABS	FCARAT3000
1	PACKING BOX PAM1360/960/560/360E	FCCAJP8800
1	PAM1360E FUSE T 16A	FCFUS60400
1	PAM960E FUSE T 10A	FCFUS60100
1	PAM560E FUSE T 6,3A	FCFUS60500
1	PAM360E FUSE T 6,3A	FCFUS60500
4	BASE ADHESIVE	FCPIE11255
2	PROTECTING M821	FCCANT0300
1	BAG FOR MANUAL 120x180mm	FCBOL00200
1	PLASTIC BAG 43x60cm	FCBOLS0100
1	PLASTIC BAG 60x80mm	FCBOL00100
1	MANUAL PAM1360/960/560/360E	FCMANMPAMKO
1	WARRANTY CARD	FCTARJG000



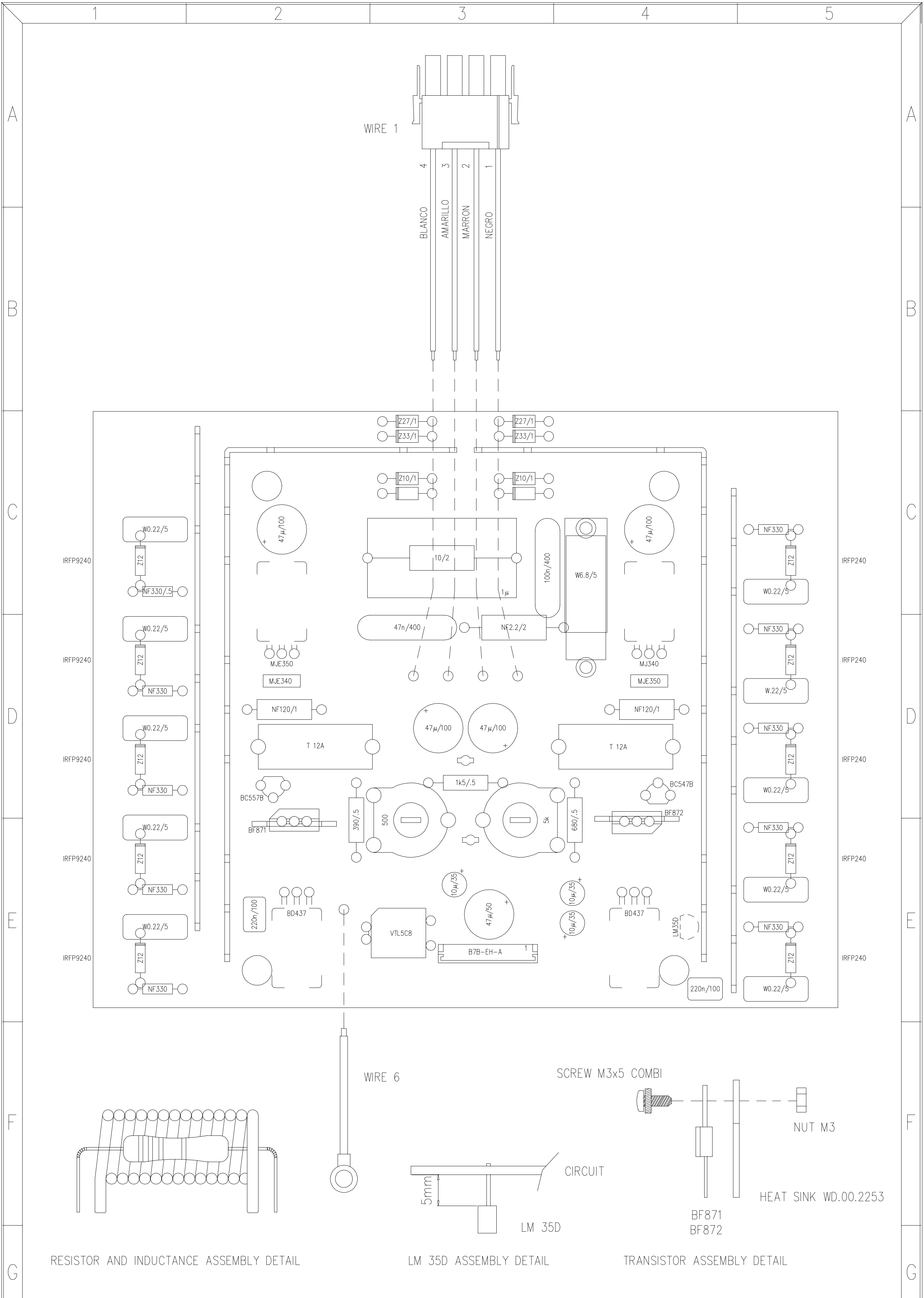


All capacitors 63 V. unless otherwise noted.
Resistors in Ohms. Capacitors in Farads. Inductors in Henries.
All resistors 1/4 W. unless otherwise noted.
See parts list for more information about components.

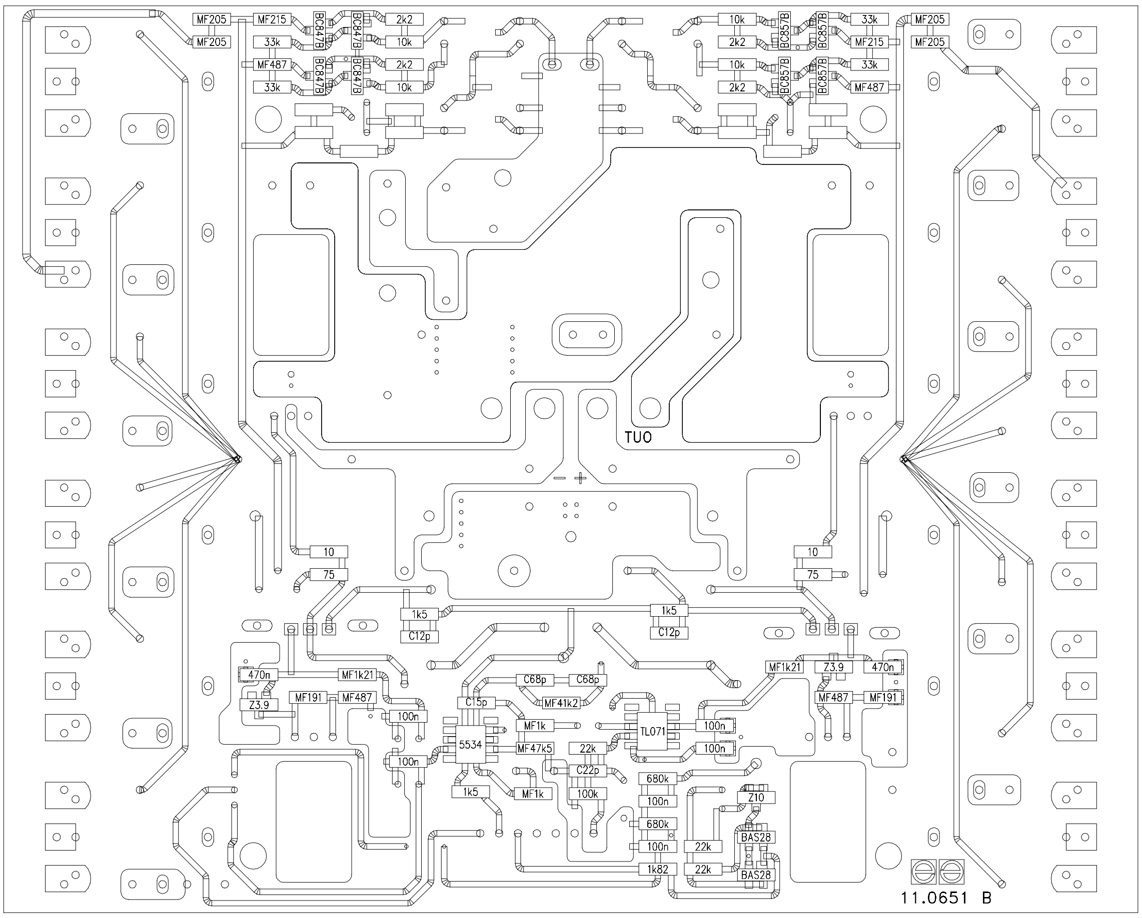
△ Factory adjusted.

Special schematic abbreviations:
MF metal film resistor
W wounded wire resistor
NF non inflammable resistor
C ceramic capacitor
Z zenner diode

TITLE: SWITCHING POWER MOSFET AMPLIFIER		MODEL: PAM960 E	ECLER — LABORATORIO DE ELECTRO-ACUSTICA, BARCELONA, ESPAÑA
		SHEET 1 OF 2	
DRAWN: J.QUERALT	DATE: 17.03.98	REPLACES:	DRW. NO. 10.0434 / REV.
CHECKED:	DATE:	REPLACED BY:	



TITLE: PRINTED CIRCUIT 11.0651 B		MODEL: PAM960E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 6 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0270 V	REV. B
CHECKED:	DATE:	REPLACED BY:	



TITLE: PRINTED CIRCUIT 11.0651 B

MODEL: PAM960E

SHEET 8 OF 14

ECLER
LABORATORIO DE ELECTRO-ACUSTICA
BARCELONA ESPAÑA

DRAWN: AMOROS/QUERALT | DATE: 10.02.98 | REPLACES:

CHECKED: | DATE: | REPLACED BY:

DRW. NO. 33.0273 V

REV. B

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM960E	DRW.Nº 33.0270B and 273B PL	REPLACES:
DATE: 001106	SHEET 1 OF 4	REPLACED BY:

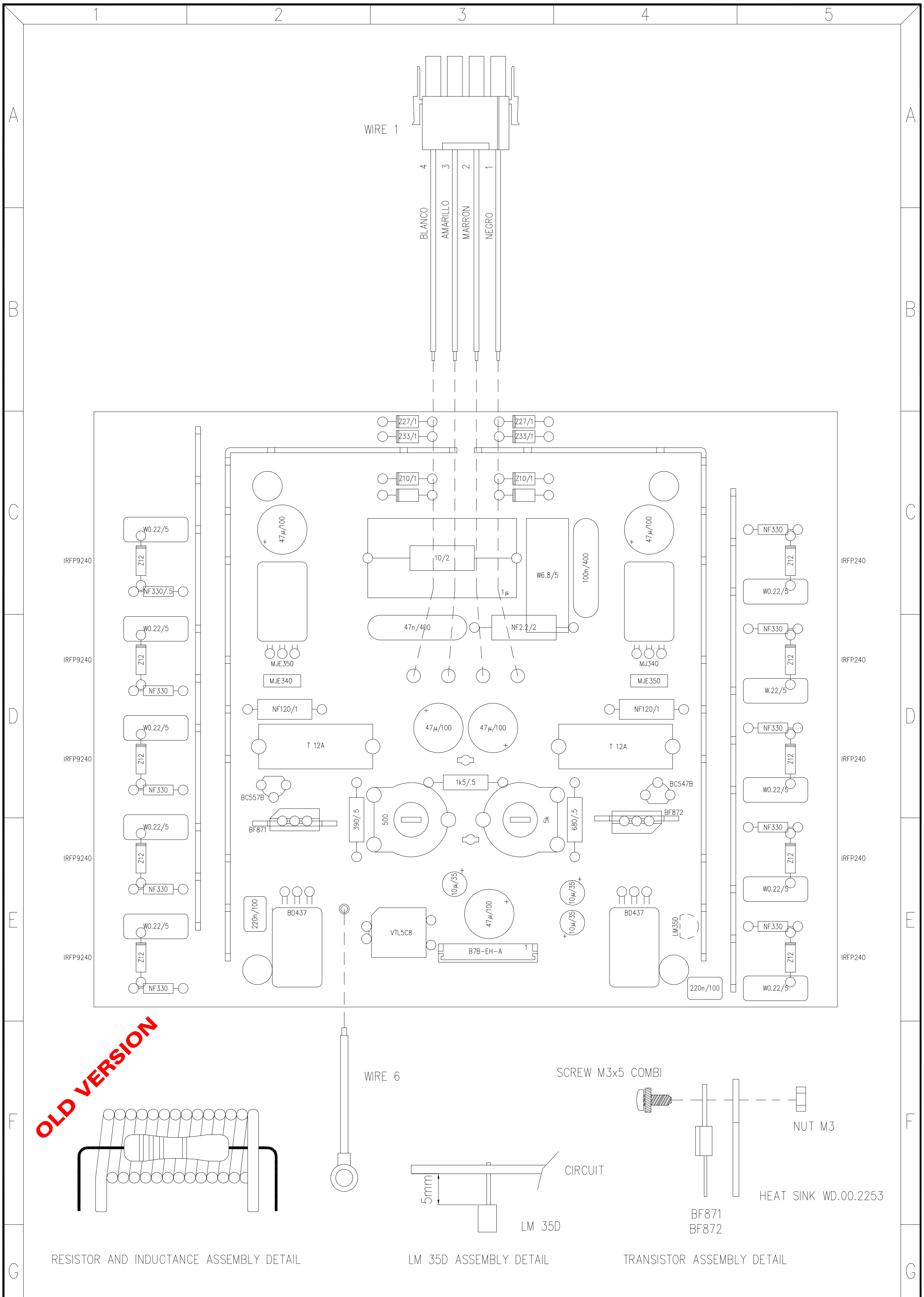
REFERENCE	VALUE	CODE
C101	100n	FCXCN41000
C102	C22p	FCXCN12200
C103	47µ/100	FCCE350470
C104	C68p	FCXCN16800
C105	C68p	FCXCN16800
C106	47µ/50	FCCE250470
C107	10µ/35	FCCE250100
C108	C15p	FCXCN11500
C109	100n	FCXCN41000
C110	47µ/100	FCCE350470
C111	10µ/35	FCCE250100
C112	10µ/35	FCCE250100
C113	470n	FCXCN44700
C114	470n	FCXCN44700
C115	47µ/100	FCCE350470
C116	220n/100	FCCDK52200
C117	47µ/100	FCCE350470
C118	220n/100	FCCDK52200
C119	Not assembled	
C120	Not assembled	
C121	100n/400	FCCDH71100
C122	47n/400	FCCDH71047
C123	100n	FCXCN41000
C124	100n	FCXCN41000
C125	100n	FCXCN41000
C126	100n	FCXCN41000
C127	C12p	FCXCN11200
C128	C12p	FCXCN11200
D101	Z3.9	FCXZ000039
D102	Z3.9	FCXZ000039
D103	Z12	FCDD041200
D104	Z12	FCDD041200
D105	Z12	FCDD041200
D106	Z12	FCDD041200
D107	Z12	FCDD041200
D108	Not assembled	
D109	Z12	FCDD041200
D110	Z12	FCDD041200
D111	Z12	FCDD041200
D112	Z12	FCDD041200
D113	Z12	FCDD041200
D114	Not assembled	
D115	Not assembled	
D116	Not assembled	
D117	Z27/1	FCDD102700
D118	Z27/1	FCDD102700
D119	Z33/1	FCDD103300
D120	Z10/1	FCDD101000
D121	Z10/1	FCDD101000
D122	Z33/1	FCDD103300
D123	BAS28	FCXDDBAS28
D124	BAS28	FCXDDBAS28
D125	Z10	FCXZ000100
F101	T 12A	FCFUS50400
F102	T 12A	FCFUS50400
H101	VTL5C8	FCOPTUTL50
IC101	LM35D	FCIC350000
IC102	TL071	FCIC071010

REFERENCE	VALUE	CODE
IC103	NE5534A	FCIC553410
IC104	TL431A	FCIC431000
IC105	TL431A	FCIC431000
J102	B7B-EH-A	FCCTM00070
L101	1µH	FCIND00100
Q101	BD437	FCTR437000
Q102	BF871	FCTR871000
Q103	BD437	FCTR437000
Q104	BF872	FCTR872000
Q105	MJE340	FCTR340000
Q106	MJE350	FCTR350000
Q107	MJE340	FCTR340000
Q108	MJE350	FCTR350000
Q109	IRFP9240	FCTR243000
Q110	IRFP9240	FCTR243000
Q111	IRFP9240	FCTR243000
Q112	IRFP9240	FCTR243000
Q113	IRFP9240	FCTR243000
Q114	Not assembled	
Q115	IRFP240	FCTR240000
Q116	IRFP240	FCTR240000
Q117	IRFP240	FCTR240000
Q118	IRFP240	FCTR240000
Q119	IRFP240	FCTR240000
Q120	Not assembled	
Q121	BC557B	FCTR557500
Q122	BC547B	FCTR547500
Q123	BC857B	FCXTT08570
Q124	BC847B	FCXTT08470
Q125	BC857B	FCXTT08570
Q126	BC847B	FCXTT08470
Q127	BC857B	FCXTT08570
Q128	BC847B	FCXTT08470
Q129	BC857B	FCXTT08570
Q130	BC847B	FCXTT08470
R101	680k	FCXR056800
R102	22k	FCXR042200
R103	100k	FCXR051000
R104	22k	FCXR042200
R105	22k	FCXR042200
R106	1k82	FCXR131820
R107	1k	FCXR031000
R108	1k5	FCXR031500
R109	MF1k	FCXR131000
R110	MF47k5	FCXR144750
R111	680k	FCXR056800
R112	MF41k2	FCXR144120
R113	MF1k21	FCXR131210
R114	MF487 Ohms	FCXR124870
R115	MF191 Ohms	FCXR121910
R116	MF487 Ohms	FCXR124870
R117	MF191 Ohms	FCXR121910
R118	MF1k21	FCXR131210
R119	390 Ohms / 1/2W	FCRF23390
R120	Adjustable 500 Ohms	FCRJP35000
R121	1k5	FCXR031500
R122	1k5	FCXR031500
R123	1k5/ 1/2W	FCRC241500

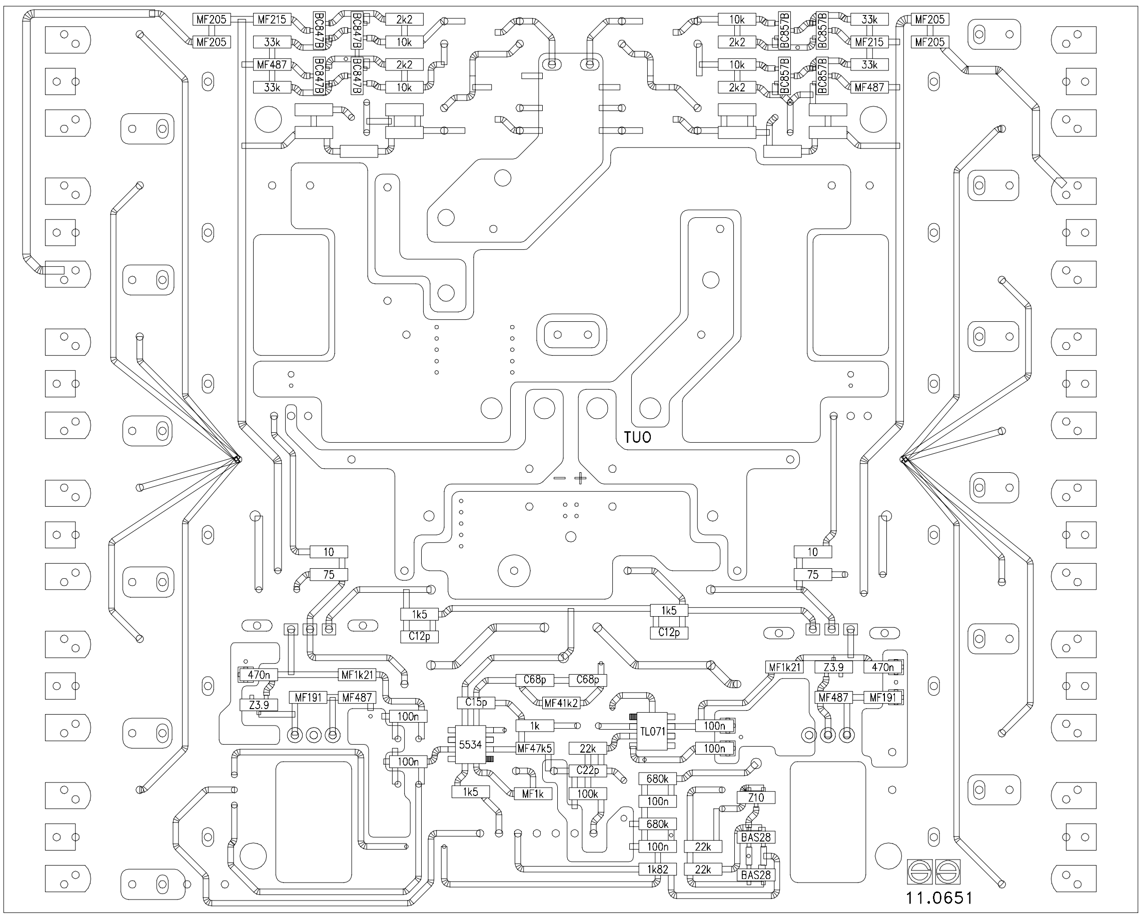
REFERENCE	VALUE	CODE
R124	Adjustable 5k	FCRJP44700
R125	680 Ohms / 1/2W	FCRF236800
R126	10 Ohms	FCXR011000
R127	10 Ohms	FCXR011000
R128	NF120 Ohms / 1W	FCRF431200
R129	NF120 Ohms / 1W	FCRF431200
R130	NF330 Ohms	FCRF233300
R131	NF330 Ohms	FCRF233300
R132	NF330 Ohms	FCRF233300
R133	NF330 Ohms	FCRF233300
R134	NF330 Ohms	FCRF233300
R135	Not assembled	
R136	NF330 Ohms	FCRF233300
R137	NF330 Ohms	FCRF233300
R138	NF330 Ohms	FCRF233300
R139	NF330 Ohms	FCRF233300
R140	NF330 Ohms	FCRF233300
R141	Not assembled	
R142	W0.22 Ohms / 5W	FCRY000100
R143	W0.22 Ohms / 5W	FCRY000100
R144	W0.22 Ohms / 5W	FCRY000100
R145	W0.22 Ohms / 5W	FCRY000100
R146	W0.22 Ohms / 5W	FCRY000100
R147	Not assembled	
R148	W0.22 Ohms / 5W	FCRY000100
R149	W0.22 Ohms / 5W	FCRY000100
R150	W0.22 Ohms / 5W	FCRY000100
R151	W0.22 Ohms / 5W	FCRY000100
R152	W0.22 Ohms / 5W	FCRY000100
R153	Not assembled	
R154	Not assembled	
R155	Not assembled	
R156	Not assembled	
R157	Not assembled	
R158	Not assembled	
R159	Not assembled	
R160	Not assembled	
R161	Not assembled	
R162	2k2	FCXR032200
R163	10k	FCXR041000
R164	10k	FCXR041000
R165	2k2	FCXR032200
R166	33k	FCXR043300
R167	33k	FCXR043300
R168	MF215 Ohms	FCXR122150
R169	MF215 Ohms	FCXR122150
R170	2k2	FCXR032200
R171	10k	FCXR041000
R172	10k	FCXR041000
R173	2k2	FCXR032200
R174	33k	FCXR043300
R175	33k	FCXR043300
R176	MF487 Ohms	FCXR124870
R177	MF487 Ohms	FCXR124870
R178	MF205 Ohms	FCXR122050
R179	MF205 Ohms	FCXR122050
R180	MF205 Ohms	FCXR122050
R181	MF205 Ohms	FCXR122050

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM960E	DRW.Nº 33.0270B and 273B PL	REPLACES:
DATE: 001106	SHEET 4 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
R182	10 Ohms / 2W	FCRC521000
R183	W6.8 Ohms / 5W	FCRY000250
R184	NF2.2 Ohms / 2W	FCRC512200
R185	75 Ohms	FCXR017500
R186	75 Ohms	FCXR017500
TP1	Test terminal	FCTERMF280
TP2	Test terminal	FCTERMF280
TS101	BLACK	WIRE 6
TS102/103/104/105	WHITE/YELLOW/BROWN/BLACK	WIRE 1



TITLE: PRINTED CIRCUIT 11.0651		MODEL: PAM960 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 9 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0270 / REV. V
CHECKED:	DATE:	REPLACED BY:	



OLD VERSION

TITLE: PRINTED CIRCUIT 11.0651		MODEL: PAM960 E SHEET 10 OF 14	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0273 V / REV.
CHECKED:	DATE:	REPLACED BY:	

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM960E	DRW.Nº 33.0270 and 273PL	REPLACES:
DATE: 10.02.98	SHEET 1 OF 4	REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
C101	100n	FCXCN41000
C102	C22p	FCXCN12200
C103	47µ/100	FCCE350470
C104	C68p	FCXCN16800
C105	C68p	FCXCN16800
C106	47µ/50	FCCE250470
C107	10µ/35	FCCE250100
C108	C15p	FCXCN11500
C109	100n	FCXCN41000
C110	47µ/100	FCCE350470
C111	10µ/35	FCCE250100
C112	10µ/35	FCCE250100
C113	470n	FCXCN44700
C114	470n	FCXCN44700
C115	47µ/100	FCCE350470
C116	220n/100	FCCDK52200
C117	47µ/100	FCCE350470
C118	220n/100	FCCDK52200
C119	Not assembled	
C120	Not assembled	
C121	100n/400	FCCDH71100
C122	47n/400	FCCDH71047
C123	100n	FCXCN41000
C124	100n	FCXCN41000
C125	100n	FCXCN41000
C126	100n	FCXCN41000
C127	C12p	FCXCN11200
C128	C12p	FCXCN11200
D101	Z3.9	FCXZ000039
D102	Z3.9	FCXZ000039
D103	Z12	FCDD041200
D104	Z12	FCDD041200
D105	Z12	FCDD041200
D106	Z12	FCDD041200
D107	Z12	FCDD041200
D108	Not assembled	
D109	Z12	FCDD041200
D110	Z12	FCDD041200
D111	Z12	FCDD041200
D112	Z12	FCDD041200
D113	Z12	FCDD041200
D114	Not assembled	
D115	Not assembled	
D116	Not assembled	
D117	Z27/1	FCDD102700
D118	Z27/1	FCDD102700
D119	Z33/1	FCDD103300
D120	Z10/1	FCDD101000
D121	Z10/1	FCDD101000
D122	Z33/1	FCDD103300
D123	BAS28	FCXDDBAS28
D124	BAS28	FCXDDBAS28
D125	Z10	FCXZ000100
F101	T 12A	FCFUS50400
F102	T 12A	FCFUS50400
H101	VTL5C8	FCOPTUTL50
IC101	LM35D	FCIC350000
IC102	TL071	FCIC071010

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM960E	DRW.Nº 33.0270 and 273PL	REPLACES:
DATE: 10.02.98	SHEET 2 OF 4	REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
IC103	NE5534A	FCIC553410
IC104	TL431A	FCIC431000
IC105	TL431A	FCIC431000
J102	B7B-EH-A	FCCTM00070
L101	1µH	FCIND00100
Q101	BD437	FCTR437000
Q102	BF871	FCTR871000
Q103	BD437	FCTR437000
Q104	BF872	FCTR872000
Q105	MJE340	FCTR340000
Q106	MJE350	FCTR350000
Q107	MJE340	FCTR340000
Q108	MJE350	FCTR350000
Q109	IRFP9240	FCTR243000
Q110	IRFP9240	FCTR243000
Q111	IRFP9240	FCTR243000
Q112	IRFP9240	FCTR243000
Q113	IRFP9240	FCTR243000
Q114	Not assembled	
Q115	IRFP240	FCTR240000
Q116	IRFP240	FCTR240000
Q117	IRFP240	FCTR240000
Q118	IRFP240	FCTR240000
Q119	IRFP240	FCTR240000
Q120	Not assembled	
Q121	BC557B	FCTR557500
Q122	BC547B	FCTR547500
Q123	BC857B	FCXTT08570
Q124	BC847B	FCXTT08470
Q125	BC857B	FCXTT08570
Q126	BC847B	FCXTT08470
Q127	BC857B	FCXTT08570
Q128	BC847B	FCXTT08470
Q129	BC857B	FCXTT08570
Q130	BC847B	FCXTT08470
R101	680k	FCXR056800
R102	22k	FCXR042200
R103	100k	FCXR051000
R104	22k	FCXR042200
R105	22k	FCXR042200
R106	1k82	FCXR131820
R107	1k	FCXR031000
R108	1k5	FCXR031500
R109	MF1k	FCXR131000
R110	MF47k5	FCXR144750
R111	680k	FCXR056800
R112	MF41k2	FCXR144120
R113	MF1k21	FCXR131210
R114	MF487 Ohms	FCXR124870
R115	MF191 Ohms	FCXR121910
R116	MF487 Ohms	FCXR124870
R117	MF191 Ohms	FCXR121910
R118	MF1k21	FCXR131210
R119	390 Ohms / 1/2W	FCRF23390
R120	Adjustable 500 Ohms	FCRJP35000
R121	1k5	FCXR031500
R122	1k5	FCXR031500
R123	1k5/ 1/2W	FCRC241500

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM960E	DRW.Nº 33.0270 and 273PL	REPLACES:
DATE: 10.02.98	SHEET 3 OF 4	REPLACED BY:

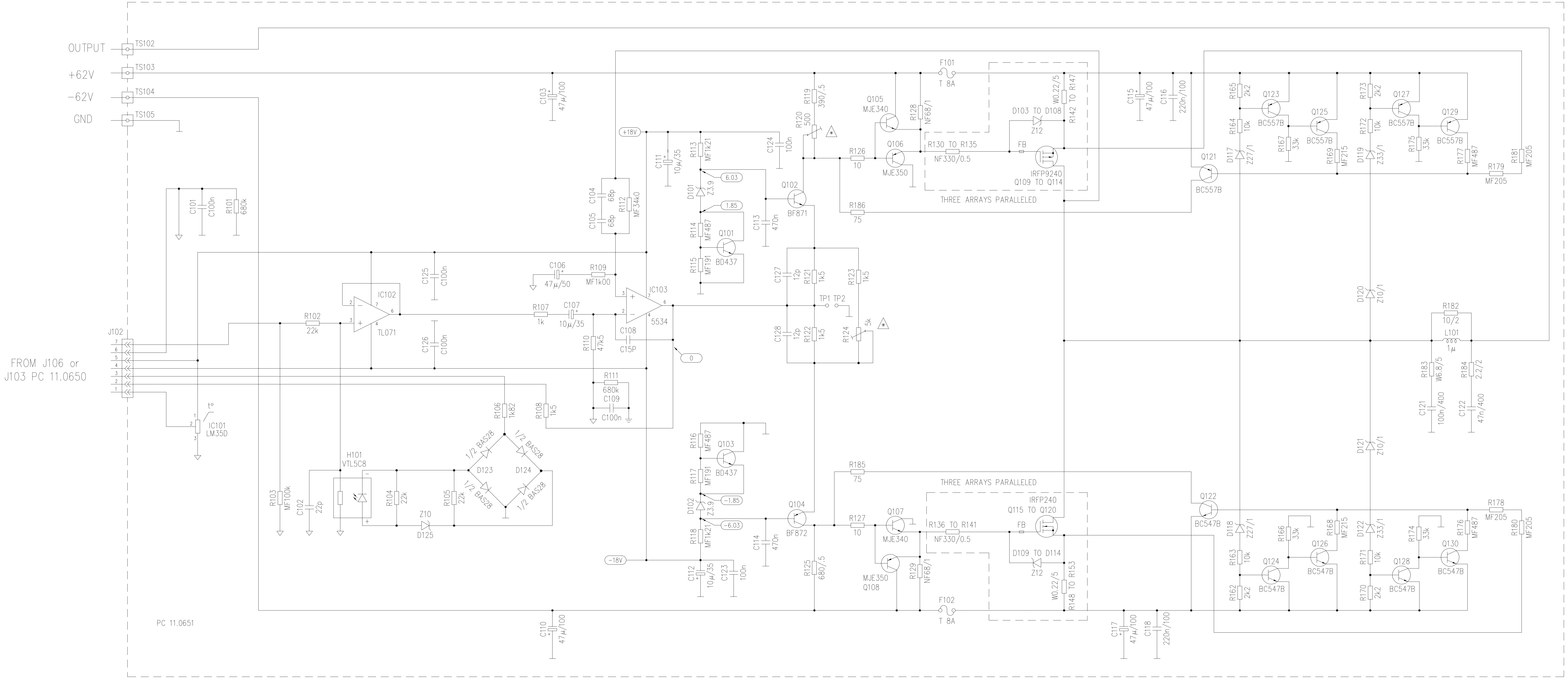
OLD VERSION

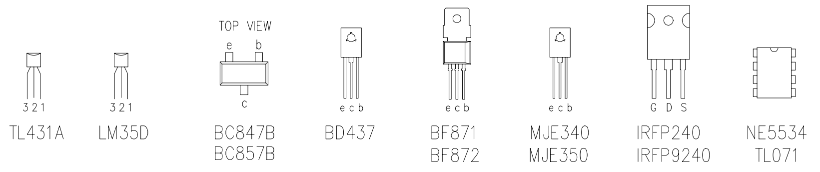
REFERENCE	VALUE	CODE
R124	Adjustable 5k	FCRJP44700
R125	680 Ohms / 1/2W	FCRF236800
R126	10 Ohms	FCXR011000
R127	10 Ohms	FCXR011000
R128	NF120 Ohms / 1W	FCRF431200
R129	NF120 Ohms / 1W	FCRF431200
R130	NF330 Ohms	FCRF233300
R131	NF330 Ohms	FCRF233300
R132	NF330 Ohms	FCRF233300
R133	NF330 Ohms	FCRF233300
R134	NF330 Ohms	FCRF233300
R135	Not assembled	
R136	NF330 Ohms	FCRF233300
R137	NF330 Ohms	FCRF233300
R138	NF330 Ohms	FCRF233300
R139	NF330 Ohms	FCRF233300
R140	NF330 Ohms	FCRF233300
R141	Not assembled	
R142	W0.22 Ohms / 5W	FCRY000100
R143	W0.22 Ohms / 5W	FCRY000100
R144	W0.22 Ohms / 5W	FCRY000100
R145	W0.22 Ohms / 5W	FCRY000100
R146	W0.22 Ohms / 5W	FCRY000100
R147	Not assembled	
R148	W0.22 Ohms / 5W	FCRY000100
R149	W0.22 Ohms / 5W	FCRY000100
R150	W0.22 Ohms / 5W	FCRY000100
R151	W0.22 Ohms / 5W	FCRY000100
R152	W0.22 Ohms / 5W	FCRY000100
R153	Not assembled	
R154	Not assembled	
R155	Not assembled	
R156	Not assembled	
R157	Not assembled	
R158	Not assembled	
R159	Not assembled	
R160	Not assembled	
R161	Not assembled	
R162	2k2	FCXR032200
R163	10k	FCXR041000
R164	10k	FCXR041000
R165	2k2	FCXR032200
R166	33k	FCXR043300
R167	33k	FCXR043300
R168	MF215 Ohms	FCXR122150
R169	MF215 Ohms	FCXR122150
R170	2k2	FCXR032200
R171	10k	FCXR041000
R172	10k	FCXR041000
R173	2k2	FCXR032200
R174	33k	FCXR043300
R175	33k	FCXR043300
R176	MF487 Ohms	FCXR124870
R177	MF487 Ohms	FCXR124870
R178	MF205 Ohms	FCXR122050
R179	MF205 Ohms	FCXR122050
R180	MF205 Ohms	FCXR122050
R181	MF205 Ohms	FCXR122050

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM960E	DRW.Nº 33.0270 and 273PL	REPLACES:
DATE: 10.02.98	SHEET 4 OF 4	REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
R182	10 Ohms / 2W	FCRC521000
R183	W6.8 Ohms / 5W	FCRY000200
R184	NF2.2 Ohms / 2W	FCRC512200
R185	75 Ohms	FCXR017500
R186	75 Ohms	FCXR017500
TP1	Test terminal	FCTERMSOL0
TP2	Test terminal	FCTERMSOL0
TS101	BLACK	WIRE 6
TS102/103/104/105	WHITE/YELLOW/BROWN/BLACK	WIRE 1



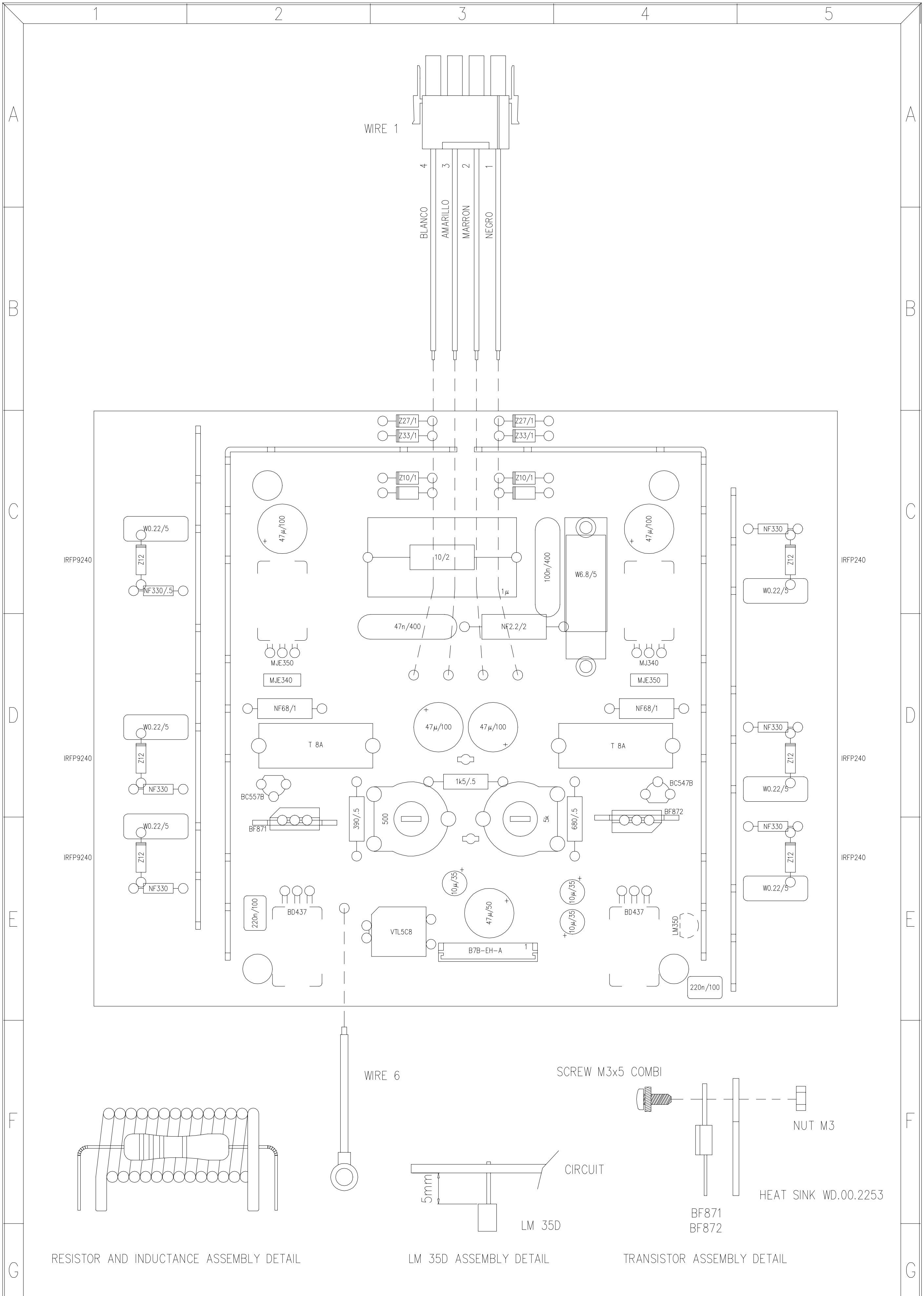


All capacitors 63 V. unless otherwise noted.
Resistors in Ohms. Capacitors in Farads. Inductors in Henries.
All resistors 1/4 W. unless otherwise noted.
See parts list for more information about components.

⚠ Factory adjusted.

Special schematic abbreviations:
- MF metal film resistor
- W wounded wire resistor
- NF non inflammable resistor
- C ceramic capacitor
- Z zenner diode

TITLE: SWITCHING POWER MOSFET AMPLIFIER		MODEL: PAM560 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 1 OF 2	
DRAWN: J.QUERALT	DATE: 17.03.98	REPLACES:	DRW. NO. 10.0435 — REV.
CHECKED:	DATE:	REPLACED BY:	



TITLE: PRINTED CIRCUIT 11.0651 B

MODEL: PAM560E

SHEET 6 OF 14

ECLER

LABORATORIO DE ELECTRO-ACUSTICA
BARCELONA ESPAÑA

DRAWN: AMOROS/QUERALT DATE: 10.02.98

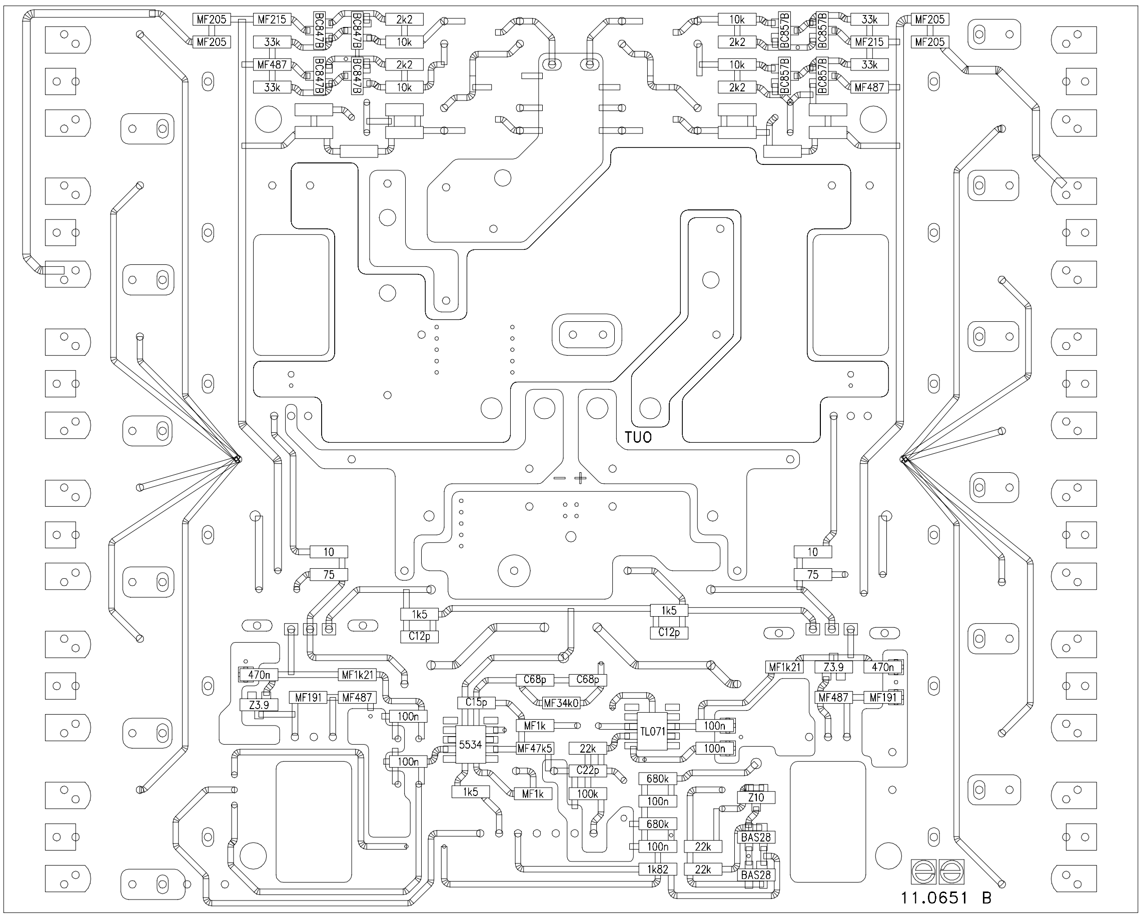
CHECKED: DATE:

REPLACES:

REPLACED BY:

DRW. NO. 33.0271 V

REV. B



TITLE: PRINTED CIRCUIT 11.0651 B	MODEL: PAM560E	ECLER
	SHEET 8 OF 14	LABORATORIO DE ELECTRO–ACUSTICA BARCELONA ESPAÑA
DRAWN: AMOROS/QUERALT — DATE: 10.02.98	REPLACES:	DRW. NO. 33.0274 V — REV. B
CHECKED: — DATE:	REPLACED BY:	

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM560E	DRW.Nº 33.0271B and 274B PL	REPLACES:
DATE: 001106	SHEET 1 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
C101	100n	FCXCN41000
C102	C22p	FCXCN12200
C103	47µ/100	FCCE350470
C104	C68p	FCXCN16800
C105	C68p	FCXCN16800
C106	47µ/50	FCCE250470
C107	10µ/35	FCCE250100
C108	C15p	FCXCN11500
C109	100n	FCXCN41000
C110	47µ/100	FCCE350470
C111	10µ/35	FCCE250100
C112	10µ/35	FCCE250100
C113	470n	FCXCN44700
C114	470n	FCXCN44700
C115	47µ/100	FCCE350470
C116	220n/100	FCCDK52200
C117	47µ/100	FCCE350470
C118	220n/100	FCCDK52200
C119	Not assembled	
C120	Not assembled	
C121	100n/400	FCCDH71100
C122	47n/400	FCCDH71047
C123	100n	FCXCN41000
C124	100n	FCXCN41000
C125	100n	FCXCN41000
C126	100n	FCXCN41000
C127	C12p	FCXCN11200
C128	C12p	FCXCN11200
D101	Z3.9	FCXZ000039
D102	Z3.9	FCXZ000039
D103	Not assembled	
D104	Z12	FCDD041200
D105	Z12	FCDD041200
D106	Not assembled	
D107	Z12	FCDD041200
D108	Not assembled	
D109	Not assembled	
D110	Z12	FCDD041200
D111	Z12	FCDD041200
D112	Not assembled	
D113	Z12	FCDD041200
D114	Not assembled	
D115	Not assembled	
D116	Not assembled	
D117	Z27/1	FCDD102700
D118	Z27/1	FCDD102700
D119	Z33/1	FCDD103300
D120	Z10/1	FCDD101000
D121	Z10/1	FCDD101000
D122	Z33/1	FCDD103300
D123	BAS28	FCXDDBAS28
D124	BAS28	FCXDDBAS28
D125	Z10	FCXZ000100
F101	T 8A	FCFUS50350
F102	T 8A	FCFUS50350
H101	VTL5C8	FCOPTUTL50
IC101	LM35D	FCIC350000
IC102	TL071	FCIC071010

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM560E	DRW.Nº 33.0271B and 274B PL	REPLACES:
DATE: 001106	SHEET 2 OF 4	REPLACED BY:

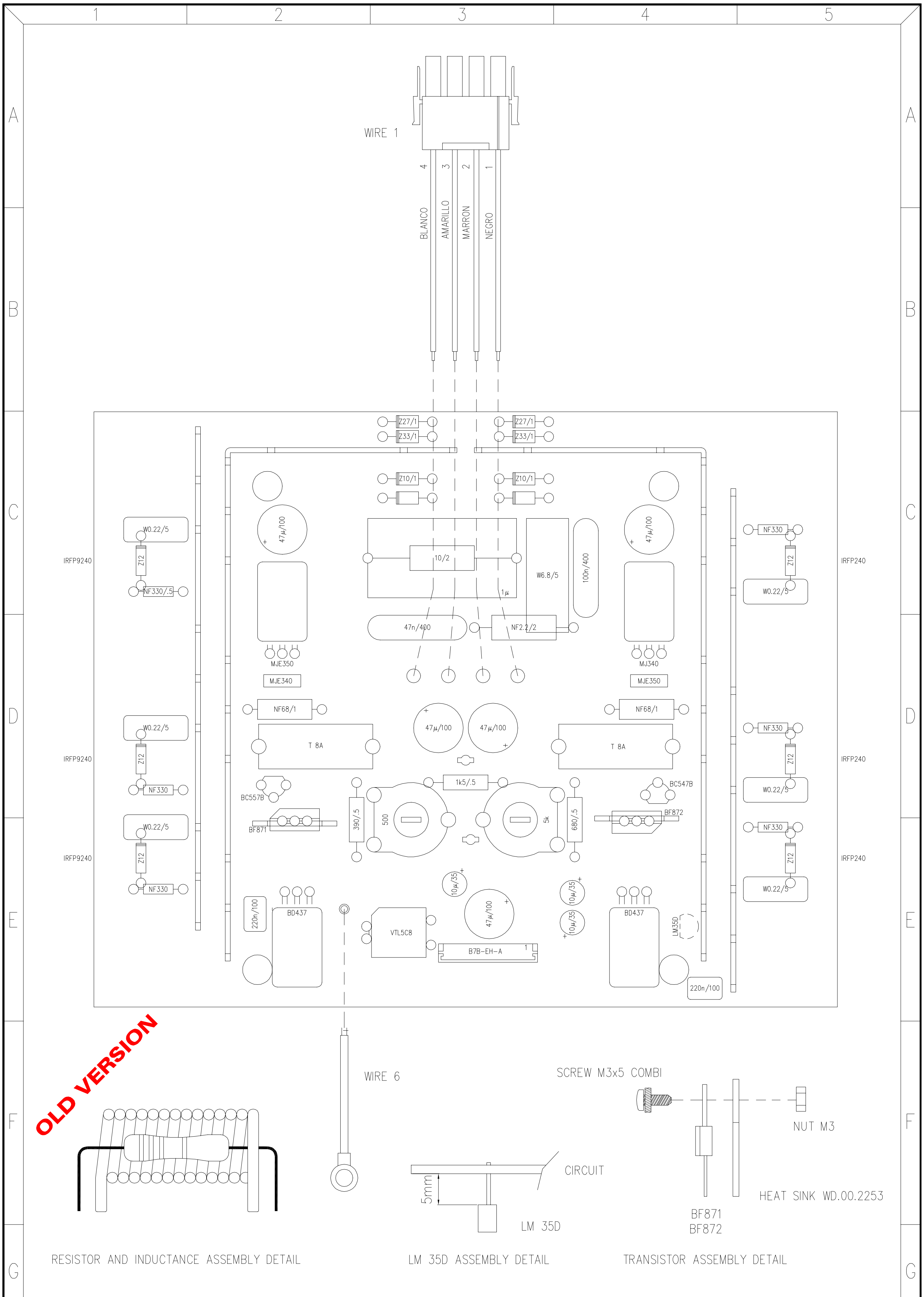
REFERENCE	VALUE	CODE
IC103	NE5534A	FCIC553410
IC104	TL431A	FCIC431000
IC105	TL431A	FCIC431000
J102	B7B-EH-A	FCCTM00070
L101	1µH	FCIND00100
Q101	BD437	FCTR437000
Q102	BF871	FCTR871000
Q103	BD437	FCTR437000
Q104	BF872	FCTR872000
Q105	MJE340	FCTR340000
Q106	MJE350	FCTR350000
Q107	MJE340	FCTR340000
Q108	MJE350	FCTR350000
Q109	Not assembled	
Q110	IRFP9240	FCTR243000
Q111	IRFP9240	FCTR243000
Q112	Not assembled	
Q113	IRFP9240	FCTR243000
Q114	Not assembled	
Q115	Not assembled	
Q116	IRFP240	FCTR240000
Q117	IRFP240	FCTR240000
Q118	Not assembled	
Q119	IRFP240	FCTR240000
Q120	Not assembled	
Q121	BC557B	FCTR557500
Q122	BC547B	FCTR547500
Q123	BC857B	FCXTT08570
Q124	BC847B	FCXTT08470
Q125	BC857B	FCXTT08570
Q126	BC847B	FCXTT08470
Q127	BC857B	FCXTT08570
Q128	BC847B	FCXTT08470
Q129	BC857B	FCXTT08570
Q130	BC847B	FCXTT08470
R101	680k	FCXR056800
R102	22k	FCXR042200
R103	100k	FCXR051000
R104	22k	FCXR042200
R105	22k	FCXR042200
R106	1k82	FCXR131820
R107	1k	FCXR031000
R108	1k5	FCXR031500
R109	MF1k	FCXR131000
R110	MF47k5	FCXR144750
R111	680k	FCXR056800
R112	MF34K0	FCXR143400
R113	MF1k21	FCXR131210
R114	MF487 Ohms	FCXR124870
R115	MF191 Ohms	FCXR121910
R116	MF487 Ohms	FCXR124870
R117	MF191 Ohms	FCXR121910
R118	MF1k21	FCXR131210
R119	390 Ohms / 1/2W	FCRF23390
R120	Adjustable 500 Ohms	FCRJP35000
R121	1k5	FCXR031500
R122	1k5	FCXR031500
R123	1k5/ 1/2W	FCRC241500

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM560E	DRW.Nº 33.0271B and 274B PL	REPLACES:
DATE: 001106	SHEET 3 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
R124	Adjustable 5k	FCRJP44700
R125	680 Ohms / 1/2W	FCRF236800
R126	10 Ohms	FCXR011000
R127	10 Ohms	FCXR011000
R128	NF68 Ohms / 1W	FCRF426800
R129	NF68 Ohms / 1W	FCRF426800
R130	Not assembled	
R131	NF330 Ohms	FCRF233300
R132	NF330 Ohms	FCRF233300
R133	Not assembled	
R134	NF330 Ohms	FCRF233300
R135	Not assembled	
R136	Not assembled	
R137	NF330 Ohms	FCRF233300
R138	NF330 Ohms	FCRF233300
R139	Not assembled	
R140	NF330 Ohms	FCRF233300
R141	Not assembled	
R142	Not assembled	
R143	W0.22 Ohms / 5W	FCRY000100
R144	W0.22 Ohms / 5W	FCRY000100
R145	Not assembled	
R146	W0.22 Ohms / 5W	FCRY000100
R147	Not assembled	
R148	Not assembled	
R149	W0.22 Ohms / 5W	FCRY000100
R150	W0.22 Ohms / 5W	FCRY000100
R151	Not assembled	
R152	W0.22 Ohms / 5W	FCRY000100
R153	Not assembled	
R154	Not assembled	
R155	Not assembled	
R156	Not assembled	
R157	Not assembled	
R158	Not assembled	
R159	Not assembled	
R160	Not assembled	
R161	Not assembled	
R162	2k2	FCXR032200
R163	10k	FCXR041000
R164	10k	FCXR041000
R165	2k2	FCXR032200
R166	33k	FCXR043300
R167	33k	FCXR043300
R168	MF215 Ohms	FCXR122150
R169	MF215 Ohms	FCXR122150
R170	2k2	FCXR032200
R171	10k	FCXR041000
R172	10k	FCXR041000
R173	2k2	FCXR032200
R174	33k	FCXR043300
R175	33k	FCXR043300
R176	MF487 Ohms	FCXR124870
R177	MF487 Ohms	FCXR124870
R178	MF205 Ohms	FCXR122050
R179	MF205 Ohms	FCXR122050
R180	MF205 Ohms	FCXR122050
R181	MF205 Ohms	FCXR122050

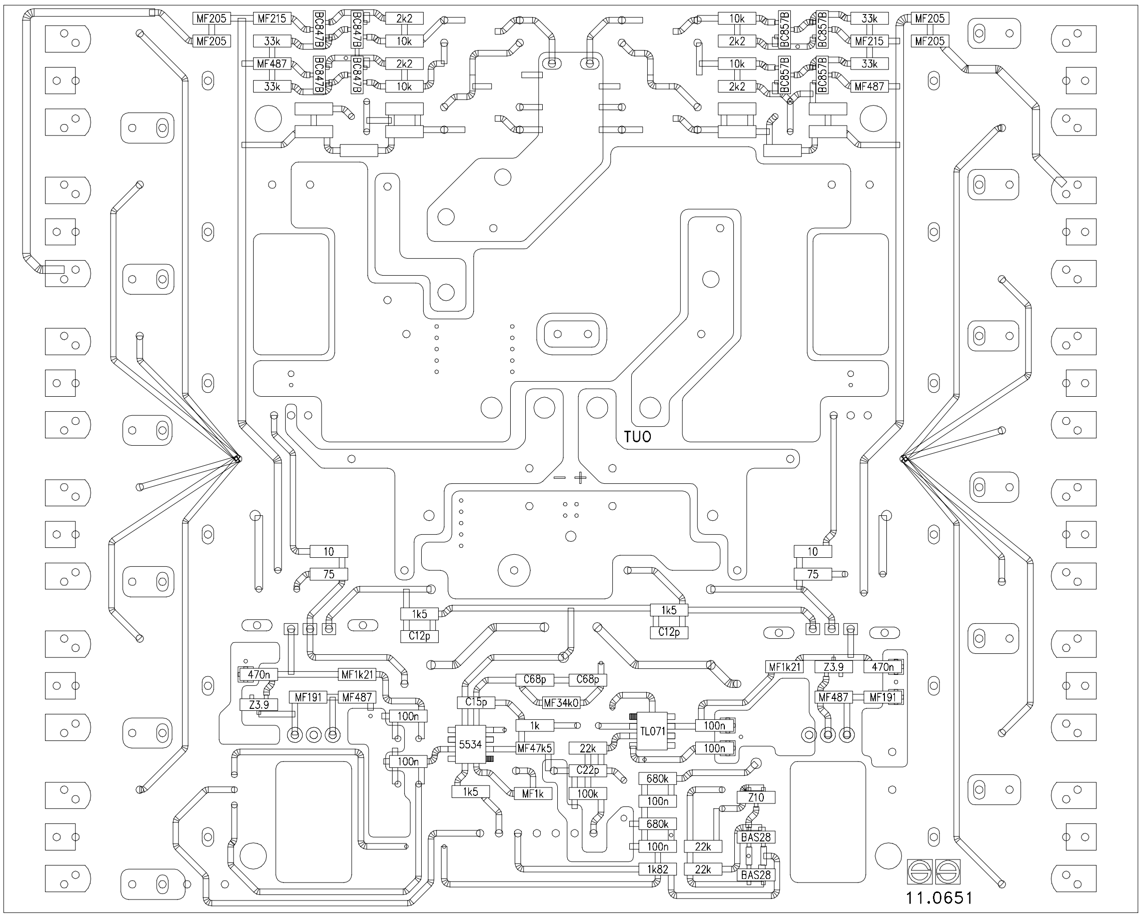
PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM560E	DRW.Nº 33.0271B and 274B PL	REPLACES:
DATE: 001106	SHEET 4 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
R182	10 Ohms / 2W	FCRC521000
R183	W6.8 Ohms / 5W	FCRY000250
R184	NF2.2 Ohms / 2W	FCRC512200
R185	75 Ohms	FCXR017500
R186	75 Ohms	FCXR017500
TP1	Test terminal	FCTERMF280
TP2	Test terminal	FCTERMF280
TS101	BLACK	WIRE 6
TS102/103/104/105	WHITE/YELLOW/BROWN/BLACK	WIRE 1



TITLE: PRINTED CIRCUIT 11.0651		MODEL: PAM560 E SHEET 11 OF 14	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0271 V — REV.
CHECKED:	DATE:	REPLACED BY:	

1	2	3	4	5



OLD VERSION

TITLE: PRINTED CIRCUIT 11.0651		MODEL: PAM560 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 12 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0274 V — REV.
CHECKED:	DATE:	REPLACED BY:	

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM560E	DRW.Nº 33.0271 and 274PL	REPLACES:
DATE: 10.02.98	SHEET 1 OF 4	REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
C101	100n	FCXCN41000
C102	C22p	FCXCN12200
C103	47µ/100	FCCE350470
C104	C68p	FCXCN16800
C105	C68p	FCXCN16800
C106	47µ/50	FCCE250470
C107	10µ/35	FCCE250100
C108	C15p	FCXCN11500
C109	100n	FCXCN41000
C110	47µ/100	FCCE350470
C111	10µ/35	FCCE250100
C112	10µ/35	FCCE250100
C113	470n	FCXCN44700
C114	470n	FCXCN44700
C115	47µ/100	FCCE350470
C116	220n/100	FCCDK52200
C117	47µ/100	FCCE350470
C118	220n/100	FCCDK52200
C119	Not assembled	
C120	Not assembled	
C121	100n/400	FCCDH71100
C122	47n/400	FCCDH71047
C123	100n	FCXCN41000
C124	100n	FCXCN41000
C125	100n	FCXCN41000
C126	100n	FCXCN41000
C127	C12p	FCXCN11200
C128	C12p	FCXCN11200
D101	Z3.9	FCXZ000039
D102	Z3.9	FCXZ000039
D103	Not assembled	
D104	Z12	FCDD041200
D105	Z12	FCDD041200
D106	Not assembled	
D107	Z12	FCDD041200
D108	Not assembled	
D109	Not assembled	
D110	Z12	FCDD041200
D111	Z12	FCDD041200
D112	Not assembled	
D113	Z12	FCDD041200
D114	Not assembled	
D115	Not assembled	
D116	Not assembled	
D117	Z27/1	FCDD102700
D118	Z27/1	FCDD102700
D119	Z33/1	FCDD103300
D120	Z10/1	FCDD101000
D121	Z10/1	FCDD101000
D122	Z33/1	FCDD103300
D123	BAS28	FCXDDBAS28
D124	BAS28	FCXDDBAS28
D125	Z10	FCXZ000100
F101	T 8A	FCFUS50350
F102	T 8A	FCFUS50350
H101	VTL5C8	FCOPTUTL50
IC101	LM35D	FCIC350000
IC102	TL071	FCIC071010

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM560E	DRW.Nº 33.0271 and 274PL	REPLACES:
DATE: 10.02.98	SHEET 2 OF 4	REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
IC103	NE5534A	FCIC553410
IC104	TL431A	FCIC431000
IC105	TL431A	FCIC431000
J102	B7B-EH-A	FCCTM00070
L101	1µH	FCIND00100
Q101	BD437	FCTR437000
Q102	BF871	FCTR871000
Q103	BD437	FCTR437000
Q104	BF872	FCTR872000
Q105	MJE340	FCTR340000
Q106	MJE350	FCTR350000
Q107	MJE340	FCTR340000
Q108	MJE350	FCTR350000
Q109	Not assembled	
Q110	IRFP9240	FCTR243000
Q111	IRFP9240	FCTR243000
Q112	Not assembled	
Q113	IRFP9240	FCTR243000
Q114	Not assembled	
Q115	Not assembled	
Q116	IRFP240	FCTR240000
Q117	IRFP240	FCTR240000
Q118	Not assembled	
Q119	IRFP240	FCTR240000
Q120	Not assembled	
Q121	BC557B	FCTR557500
Q122	BC547B	FCTR547500
Q123	BC857B	FCXTT08570
Q124	BC847B	FCXTT08470
Q125	BC857B	FCXTT08570
Q126	BC847B	FCXTT08470
Q127	BC857B	FCXTT08570
Q128	BC847B	FCXTT08470
Q129	BC857B	FCXTT08570
Q130	BC847B	FCXTT08470
R101	680k	FCXR056800
R102	22k	FCXR042200
R103	100k	FCXR051000
R104	22k	FCXR042200
R105	22k	FCXR042200
R106	1k82	FCXR131820
R107	1k	FCXR031000
R108	1k5	FCXR031500
R109	MF1k	FCXR131000
R110	MF47k5	FCXR144750
R111	680k	FCXR056800
R112	MF34K0	FCXR143400
R113	MF1k21	FCXR131210
R114	MF487 Ohms	FCXR124870
R115	MF191 Ohms	FCXR121910
R116	MF487 Ohms	FCXR124870
R117	MF191 Ohms	FCXR121910
R118	MF1k21	FCXR131210
R119	390 Ohms / 1/2W	FCRF23390
R120	Adjustable 500 Ohms	FCRJP35000
R121	1k5	FCXR031500
R122	1k5	FCXR031500
R123	1k5/ 1/2W	FCRC241500

PARTS LIST: MODEL: PAM560E DATE: 10.02.98

PRINTED CIRCUIT 11.0651
DRW.Nº 33.0271 and 274PL
SHEET 3 OF 4

REV:
REPLACES:
REPLACED BY:

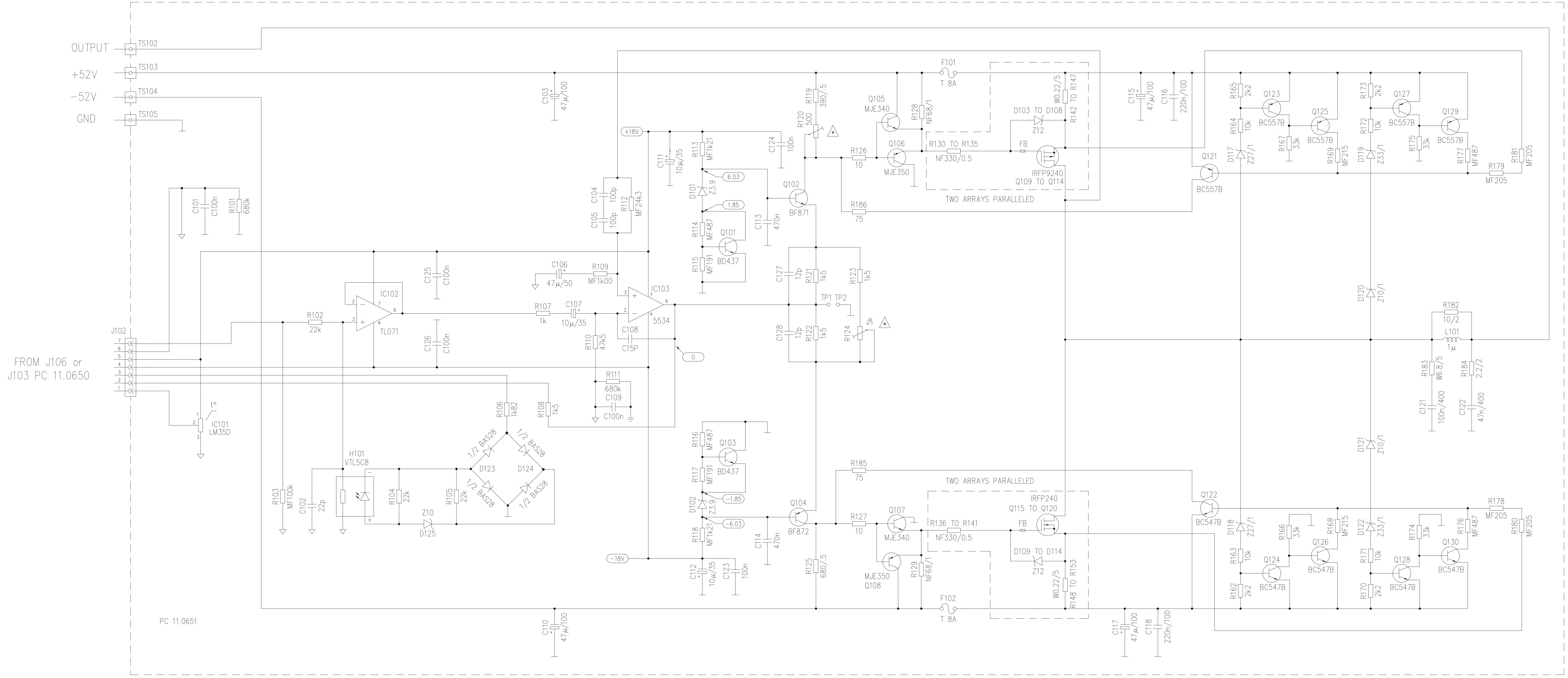
OLD VERSION

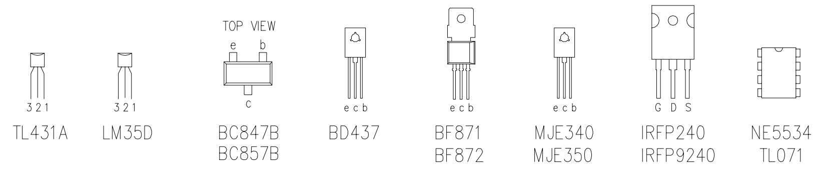
REFERENCE	VALUE	CODE
R124	Adjustable 5k	FCRJP44700
R125	680 Ohms / 1/2W	FCRF236800
R126	10 Ohms	FCXR011000
R127	10 Ohms	FCXR011000
R128	NF68 Ohms / 1W	FCRF426800
R129	NF68 Ohms / 1W	FCRF426800
R130	Not assembled	
R131	NF330 Ohms	FCRF233300
R132	NF330 Ohms	FCRF233300
R133	Not assembled	
R134	NF330 Ohms	FCRF233300
R135	Not assembled	
R136	Not assembled	
R137	NF330 Ohms	FCRF233300
R138	NF330 Ohms	FCRF233300
R139	Not assembled	
R140	NF330 Ohms	FCRF233300
R141	Not assembled	
R142	Not assembled	
R143	W0.22 Ohms / 5W	FCRY000100
R144	W0.22 Ohms / 5W	FCRY000100
R145	Not assembled	
R146	W0.22 Ohms / 5W	FCRY000100
R147	Not assembled	
R148	Not assembled	
R149	W0.22 Ohms / 5W	FCRY000100
R150	W0.22 Ohms / 5W	FCRY000100
R151	Not assembled	
R152	W0.22 Ohms / 5W	FCRY000100
R153	Not assembled	
R154	Not assembled	
R155	Not assembled	
R156	Not assembled	
R157	Not assembled	
R158	Not assembled	
R159	Not assembled	
R160	Not assembled	
R161	Not assembled	
R162	2k2	FCXR032200
R163	10k	FCXR041000
R164	10k	FCXR041000
R165	2k2	FCXR032200
R166	33k	FCXR043300
R167	33k	FCXR043300
R168	MF215 Ohms	FCXR122150
R169	MF215 Ohms	FCXR122150
R170	2k2	FCXR032200
R171	10k	FCXR041000
R172	10k	FCXR041000
R173	2k2	FCXR032200
R174	33k	FCXR043300
R175	33k	FCXR043300
R176	MF487 Ohms	FCXR124870
R177	MF487 Ohms	FCXR124870
R178	MF205 Ohms	FCXR122050
R179	MF205 Ohms	FCXR122050
R180	MF205 Ohms	FCXR122050
R181	MF205 Ohms	FCXR122050

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM560E	DRW.Nº 33.0271 and 274PL	REPLACES:
DATE: 10.02.98	SHEET 4 OF 4	REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
R182	10 Ohms / 2W	FCRC521000
R183	W6.8 Ohms / 5W	FCRY000200
R184	NF2.2 Ohms / 2W	FCRC512200
R185	75 Ohms	FCXR017500
R186	75 Ohms	FCXR017500
TP1	Test terminal	FCTERMSOL0
TP2	Test terminal	FCTERMSOL0
TS101	BLACK	WIRE 6
TS102/103/104/105	WHITE/YELLOW/BROWN/BLACK	WIRE 1



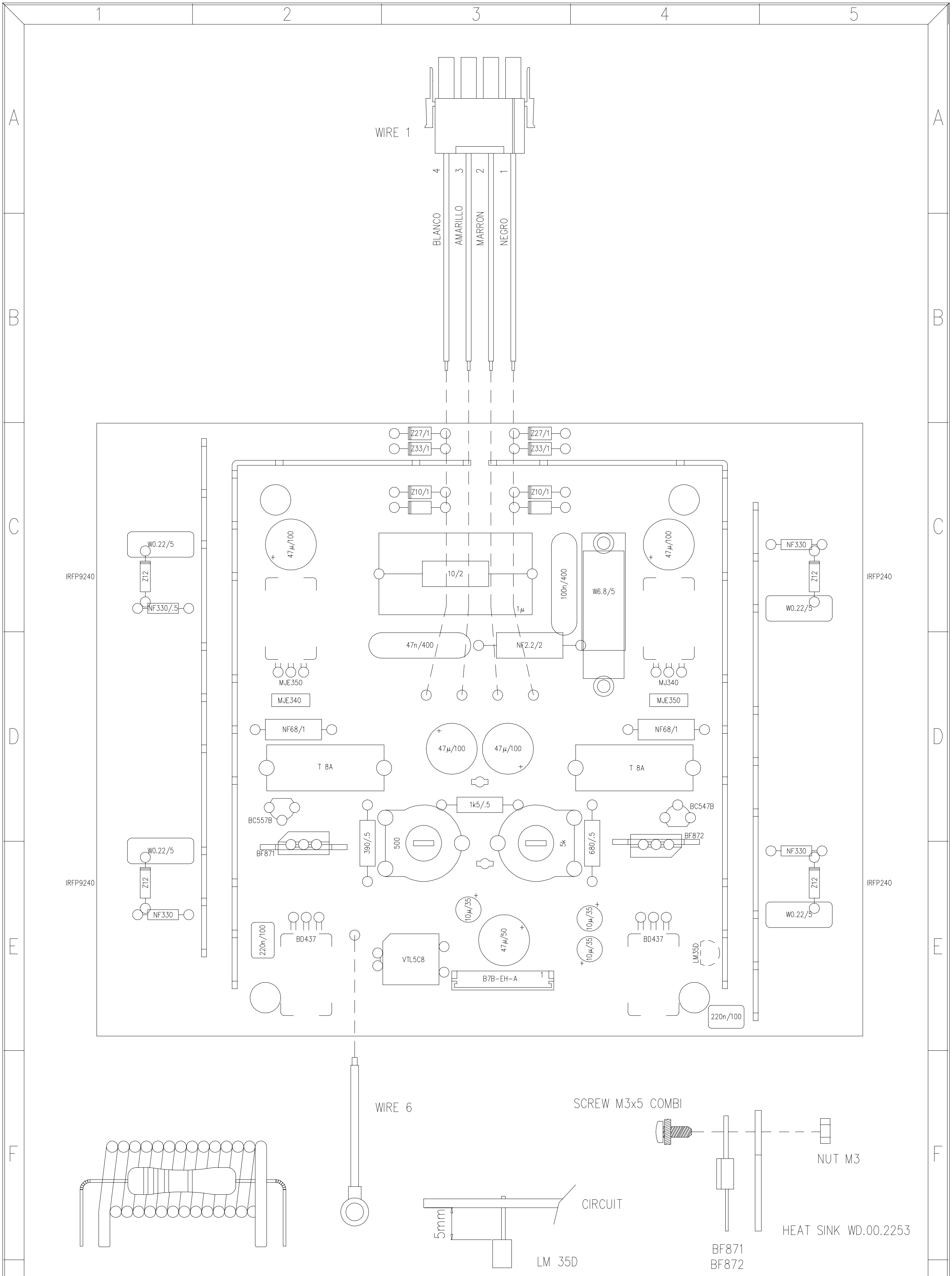


All capacitors 63 V. unless otherwise noted.
Resistors in Ohms. Capacitors in Farads. Inductors in Henries.
All resistors 1/4 W. unless otherwise noted.
See parts list for more information about components.

△ Factory adjusted.

Special schematic abbreviations:
MF metal film resistor
W wounded wire resistor
NF non inflammable resistor
C ceramic capacitor
Z zenner diode

TITLE: SWITCHING POWER MOSFET AMPLIFIER	MODEL: PAM360 E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA	
	SHEET 1 OF 2		
DRAWN: J.QUERALT / DATE: 17.03.98	REPLACES:	DRW. NO. 10.0436	REV.
CHECKED: / DATE:	REPLACED BY:		

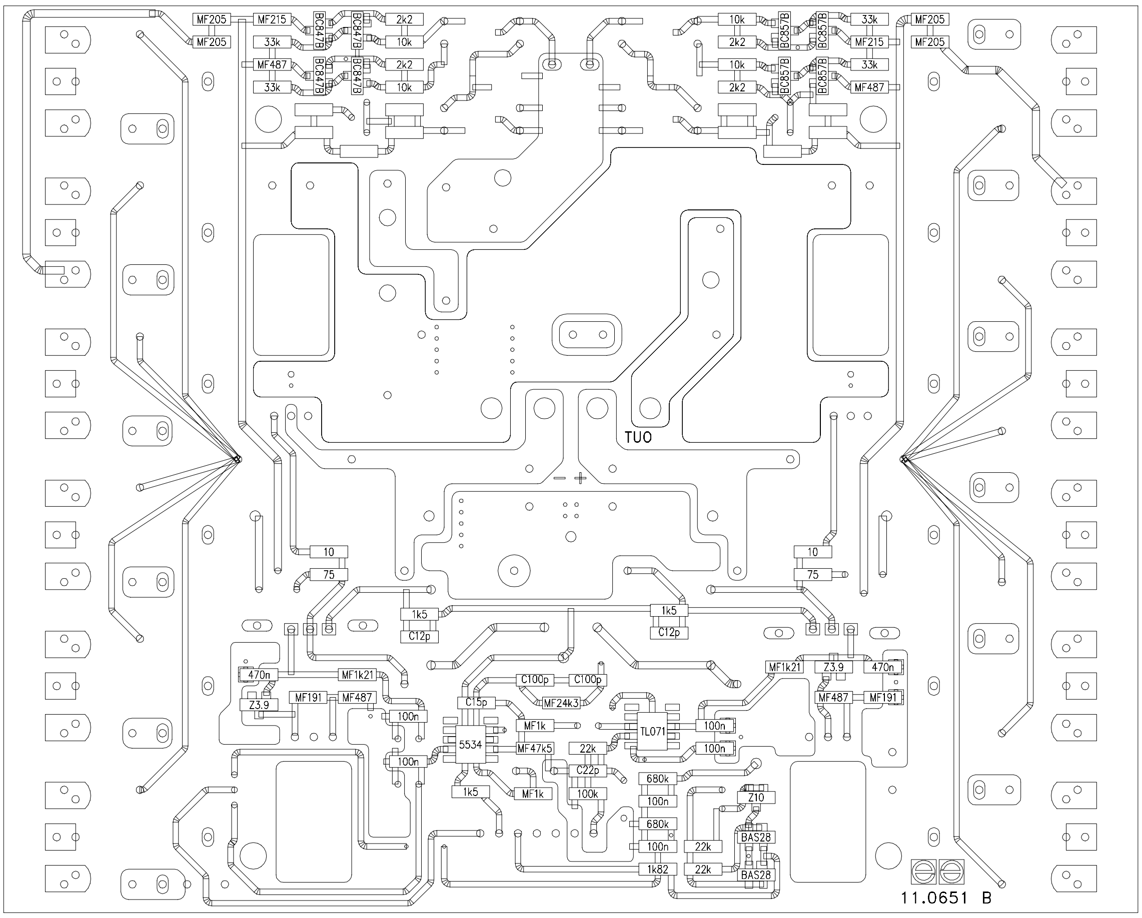


RESISTOR AND INDUCTANCE ASSEMBLY DETAIL

LM 35D ASSEMBLY DETAIL

TRANSISTOR ASSEMBLY DETAIL

TITLE: PRINTED CIRCUIT 11.0651 B		MODEL: PAM360E SHEET 6 OF 14	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0272 V — REV. B
CHECKED:	DATE:	REPLACED BY:	



TITLE: PRINTED CIRCUIT 11.0651 B		MODEL: PAM360E	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
		SHEET 8 OF 14	
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0275 V / REV. B
CHECKED:	DATE:	REPLACED BY:	

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM360E	DRW.Nº 33.0272B and 275B PL	REPLACES:
DATE: 001106	SHEET 1 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
C101	100n	FCXCN41000
C102	C22p	FCXCN12200
C103	47µ/100	FCCE350470
C104	C100p	FCXCN21000
C105	C100p	FCXCN21000
C106	47µ/50	FCCE250470
C107	10µ/35	FCCE250100
C108	C15p	FCXCN11500
C109	100n	FCXCN41000
C110	47µ/100	FCCE350470
C111	10µ/35	FCCE250100
C112	10µ/35	FCCE250100
C113	470n	FCXCN44700
C114	470n	FCXCN44700
C115	47µ/100	FCCE350470
C116	220n/100	FCCDK52200
C117	47µ/100	FCCE350470
C118	220n/100	FCCDK52200
C119	Not assembled	
C120	Not assembled	
C121	100n/400	FCCDH71100
C122	47n/400	FCCDH71047
C123	100n	FCXCN41000
C124	100n	FCXCN41000
C125	100n	FCXCN41000
C126	100n	FCXCN41000
C127	C12p	FCXCN11200
C128	C12p	FCXCN11200
D101	Z3.9	FCXZ000039
D102	Z3.9	FCXZ000039
D103	Not assembled	
D104	Z12	FCDD041200
D105	Not assembled	
D106	Not assembled	
D107	Z12	FCDD041200
D108	Not assembled	
D109	Not assembled	
D110	Z12	FCDD041200
D111	Not assembled	
D112	Not assembled	
D113	Z12	FCDD041200
D114	Not assembled	
D115	Not assembled	
D116	Not assembled	
D117	Z27/1	FCDD102700
D118	Z27/1	FCDD102700
D119	Z33/1	FCDD103300
D120	Z10/1	FCDD101000
D121	Z10/1	FCDD101000
D122	Z33/1	FCDD103300
D123	BAS28	FCXDDBAS28
D124	BAS28	FCXDDBAS28
D125	Z10	FCXZ000100
F101	T 8A	FCFUS50350
F102	T 8A	FCFUS50350
H101	VTL5C8	FCOPTUTL50
IC101	LM35D	FCIC350000
IC102	TL071	FCIC071010

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM360E	DRW.Nº 33.0272B and 275B PL	REPLACES:
DATE: 001106	SHEET 2 OF 4	REPLACED BY:

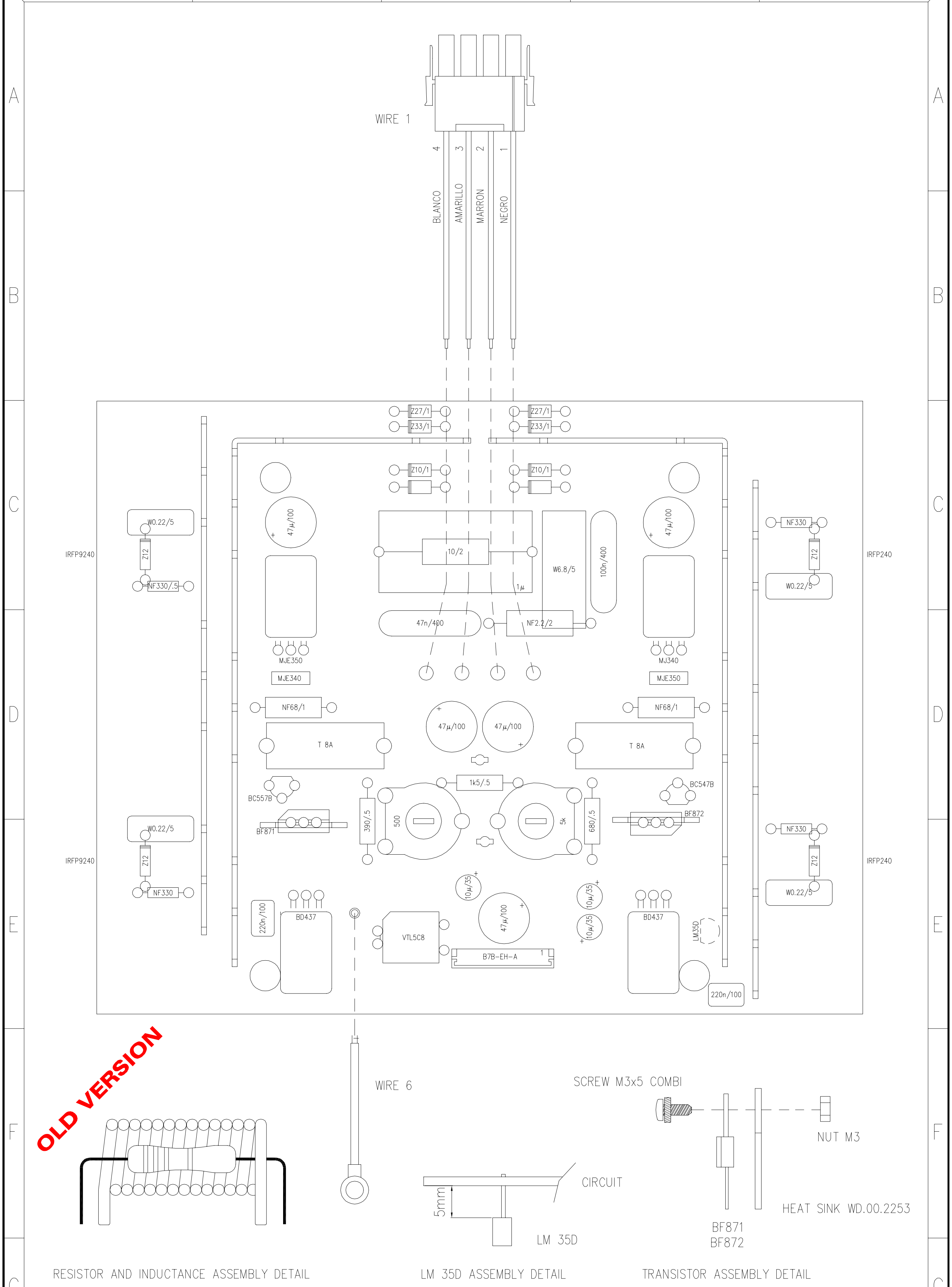
REFERENCE	VALUE	CODE
IC103	NE5534A	FCIC553410
IC104	TL431A	FCIC431000
IC105	TL431A	FCIC431000
J102	B7B-EH-A	FCCTM00070
L101	1µH	FCIND00100
Q101	BD437	FCTR437000
Q102	BF871	FCTR871000
Q103	BD437	FCTR437000
Q104	BF872	FCTR872000
Q105	MJE340	FCTR340000
Q106	MJE350	FCTR350000
Q107	MJE340	FCTR340000
Q108	MJE350	FCTR350000
Q109	Not assembled	
Q110	IRFP9240	FCTR243000
Q111	Not assembled	
Q112	Not assembled	
Q113	IRFP9240	FCTR243000
Q114	Not assembled	
Q115	Not assembled	
Q116	IRFP240	FCTR240000
Q117	Not assembled	
Q118	Not assembled	
Q119	IRFP240	FCTR240000
Q120	Not assembled	
Q121	BC557B	FCTR557500
Q122	BC547B	FCTR547500
Q123	BC857B	FCXTT08570
Q124	BC847B	FCXTT08470
Q125	BC857B	FCXTT08570
Q126	BC847B	FCXTT08470
Q127	BC857B	FCXTT08570
Q128	BC847B	FCXTT08470
Q129	BC857B	FCXTT08570
Q130	BC847B	FCXTT08470
R101	680k	FCXR056800
R102	22k	FCXR042200
R103	100k	FCXR051000
R104	22k	FCXR042200
R105	22k	FCXR042200
R106	1k82	FCXR131820
R107	1k	FCXR031000
R108	1k5	FCXR031500
R109	MF1k	FCXR131000
R110	MF47k5	FCXR144750
R111	680k	FCXR056800
R112	MF24k0	FCXR142430
R113	MF1k21	FCXR131210
R114	MF487 Ohms	FCXR124870
R115	MF191 Ohms	FCXR121910
R116	MF487 Ohms	FCXR124870
R117	MF191 Ohms	FCXR121910
R118	MF1k21	FCXR131210
R119	390 Ohms / 1/2W	FCRF23390
R120	Adjustable 500 Ohms	FCRJP35000
R121	1k5	FCXR031500
R122	1k5	FCXR031500
R123	1k5/ 1/2W	FCRC241500

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM360E	DRW.Nº 33.0272B and 275B PL	REPLACES:
DATE: 001106	SHEET 3 OF 4	REPLACED BY:

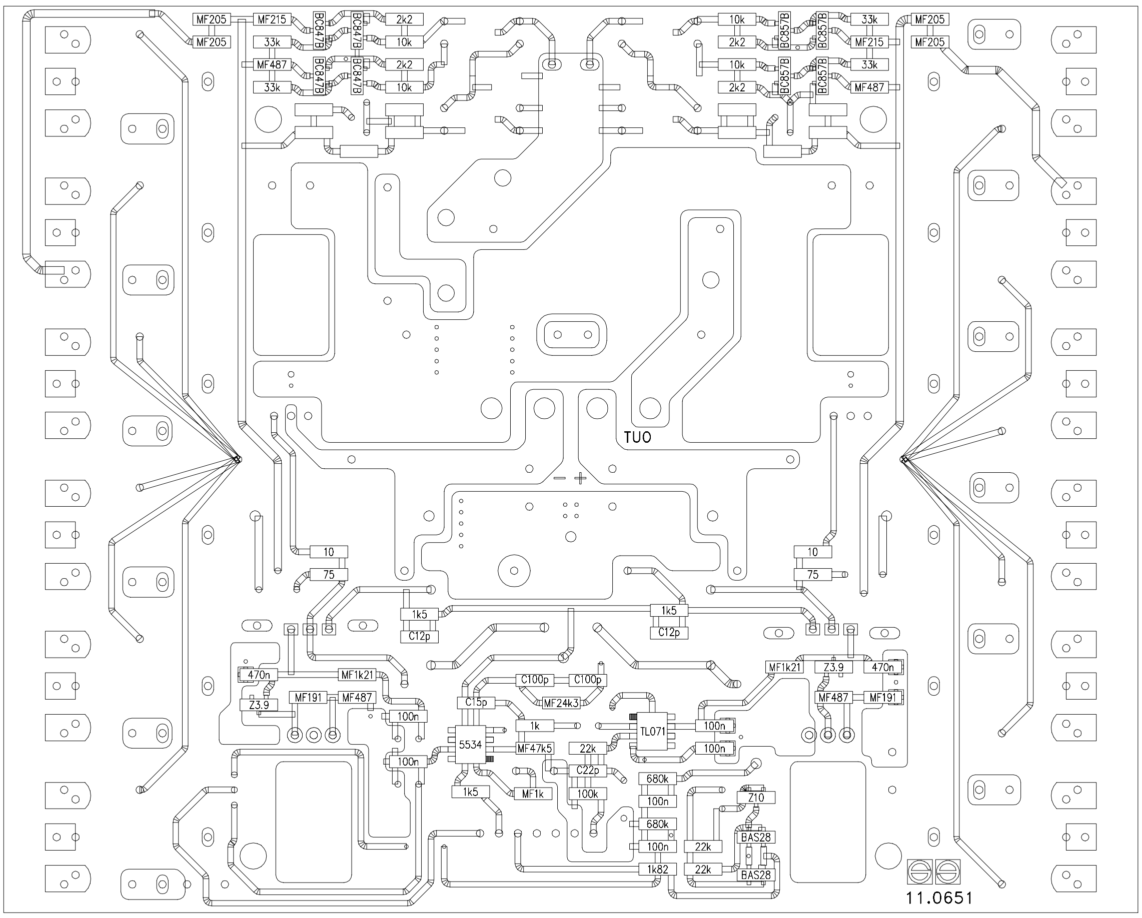
REFERENCE	VALUE	CODE
R124	Adjustable 5k	FCRJP44700
R125	680 Ohms / 1/2W	FCRF236800
R126	10 Ohms	FCXR011000
R127	10 Ohms	FCXR011000
R128	NF68 Ohms / 1W	FCRF426800
R129	NF68 Ohms / 1W	FCRF426800
R130	Not assembled	
R131	NF330 Ohms	FCRF233300
R132	Not assembled	
R133	Not assembled	
R134	NF330 Ohms	FCRF233300
R135	Not assembled	
R136	Not assembled	
R137	NF330 Ohms	FCRF233300
R138	Not assembled	
R139	Not assembled	
R140	NF330 Ohms	FCRF233300
R141	Not assembled	
R142	Not assembled	
R143	W0.22 Ohms / 5W	FCRY000100
R144	Not assembled	
R145	Not assembled	
R146	W0.22 Ohms / 5W	FCRY000100
R147	Not assembled	
R148	Not assembled	
R149	W0.22 Ohms / 5W	FCRY000100
R150	Not assembled	
R151	Not assembled	
R152	W0.22 Ohms / 5W	FCRY000100
R153	Not assembled	
R154	Not assembled	
R155	Not assembled	
R156	Not assembled	
R157	Not assembled	
R158	Not assembled	
R159	Not assembled	
R160	Not assembled	
R161	Not assembled	
R162	2k2	FCXR032200
R163	10k	FCXR041000
R164	10k	FCXR041000
R165	2k2	FCXR032200
R166	33k	FCXR043300
R167	33k	FCXR043300
R168	MF215 Ohms	FCXR122150
R169	MF215 Ohms	FCXR122150
R170	2k2	FCXR032200
R171	10k	FCXR041000
R172	10k	FCXR041000
R173	2k2	FCXR032200
R174	33k	FCXR043300
R175	33k	FCXR043300
R176	MF487 Ohms	FCXR124870
R177	MF487 Ohms	FCXR124870
R178	MF205 Ohms	FCXR122050
R179	MF205 Ohms	FCXR122050
R180	MF205 Ohms	FCXR122050
R181	MF205 Ohms	FCXR122050

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM360E	DRW.Nº 33.0272B and 275B PL	REPLACES:
DATE: 001106	SHEET 4 OF 4	REPLACED BY:

REFERENCE	VALUE	CODE
R182	10 Ohms / 2W	FCRC521000
R183	W6.8 Ohms / 5W	FCRY000250
R184	NF2.2 Ohms / 2W	FCRC512200
R185	75 Ohms	FCXR017500
R186	75 Ohms	FCXR017500
TP1	Test terminal	FCTERMF280
TP2	Test terminal	FCTERMF280
TS101	BLACK	WIRE 6
TS102/103/104/105	WHITE/YELLOW/BROWN/BLACK	WIRE 1



TITLE: PRINTED CIRCUIT 11.0651		MODEL: PAM360 E SHEET 13 OF 14	ECLER LABORATORIO DE ELECTRO–ACUSTICA BARCELONA ESPAÑA
DRAWN: AMOROS/QUERALT	DATE: 10.02.98	REPLACES:	DRW. NO. 33.0272 V / REV.
CHECKED:	DATE:	REPLACED BY:	



OLD VERSION

TITLE: PRINTED CIRCUIT 11.0651	MODEL: PAM360 E SHEET 14 OF 14	ECLER LABORATORIO DE ELECTRO-ACUSTICA BARCELONA ESPAÑA
DRAWN: AMOROS/QUERALT — DATE: 10.02.98	REPLACES:	DRW. NO. 33.0275 V — REV.
CHECKED: — DATE:	REPLACED BY:	

PARTS LIST: | PRINTED CIRCUIT 11.0651 | REV:
MODEL: PAM360E | DRW.Nº 33.0272 and 275PL | REPLACES:
DATE: 10.02.98 | SHEET 1 OF 4 | REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
C101	100n	FCXCN41000
C102	C22p	FCXCN12200
C103	47µ/100	FCCE350470
C104	C100p	FCXCN21000
C105	C100p	FCXCN21000
C106	47µ/50	FCCE250470
C107	10µ/35	FCCE250100
C108	C15p	FCXCN11500
C109	100n	FCXCN41000
C110	47µ/100	FCCE350470
C111	10µ/35	FCCE250100
C112	10µ/35	FCCE250100
C113	470n	FCXCN44700
C114	470n	FCXCN44700
C115	47µ/100	FCCE350470
C116	220n/100	FCCDK52200
C117	47µ/100	FCCE350470
C118	220n/100	FCCDK52200
C119	Not assembled	
C120	Not assembled	
C121	100n/400	FCCDH71100
C122	47n/400	FCCDH71047
C123	100n	FCXCN41000
C124	100n	FCXCN41000
C125	100n	FCXCN41000
C126	100n	FCXCN41000
C127	C12p	FCXCN11200
C128	C12p	FCXCN11200
D101	Z3.9	FCXZ000039
D102	Z3.9	FCXZ000039
D103	Not assembled	
D104	Z12	FCDD041200
D105	Not assembled	
D106	Not assembled	
D107	Z12	FCDD041200
D108	Not assembled	
D109	Not assembled	
D110	Z12	FCDD041200
D111	Not assembled	
D112	Not assembled	
D113	Z12	FCDD041200
D114	Not assembled	
D115	Not assembled	
D116	Not assembled	
D117	Z27/1	FCDD102700
D118	Z27/1	FCDD102700
D119	Z33/1	FCDD103300
D120	Z10/1	FCDD101000
D121	Z10/1	FCDD101000
D122	Z33/1	FCDD103300
D123	BAS28	FCXDDBAS28
D124	BAS28	FCXDDBAS28
D125	Z10	FCXZ000100
F101	T 8A	FCFUS50350
F102	T 8A	FCFUS50350
H101	VTL5C8	FCOPTUTL50
IC101	LM35D	FCIC350000
IC102	TL071	FCIC071010

PARTS LIST: PRINTED CIRCUIT 11.0651 REV:
MODEL: PAM360E DRW.Nº 33.0272 and 275PL REPLACES:
DATE: 10.02.98 SHEET 2 OF 4 REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
IC103	NE5534A	FCIC553410
IC104	TL431A	FCIC431000
IC105	TL431A	FCIC431000
J102	B7B-EH-A	FCCTM00070
L101	1µH	FCIND00100
Q101	BD437	FCTR437000
Q102	BF871	FCTR871000
Q103	BD437	FCTR437000
Q104	BF872	FCTR872000
Q105	MJE340	FCTR340000
Q106	MJE350	FCTR350000
Q107	MJE340	FCTR340000
Q108	MJE350	FCTR350000
Q109	Not assembled	
Q110	IRFP9240	FCTR243000
Q111	Not assembled	
Q112	Not assembled	
Q113	IRFP9240	FCTR243000
Q114	Not assembled	
Q115	Not assembled	
Q116	IRFP240	FCTR240000
Q117	Not assembled	
Q118	Not assembled	
Q119	IRFP240	FCTR240000
Q120	Not assembled	
Q121	BC557B	FCTR557500
Q122	BC547B	FCTR547500
Q123	BC857B	FCXTT08570
Q124	BC847B	FCXTT08470
Q125	BC857B	FCXTT08570
Q126	BC847B	FCXTT08470
Q127	BC857B	FCXTT08570
Q128	BC847B	FCXTT08470
Q129	BC857B	FCXTT08570
Q130	BC847B	FCXTT08470
R101	680k	FCXR056800
R102	22k	FCXR042200
R103	100k	FCXR051000
R104	22k	FCXR042200
R105	22k	FCXR042200
R106	1k82	FCXR131820
R107	1k	FCXR031000
R108	1k5	FCXR031500
R109	MF1k	FCXR131000
R110	MF47k5	FCXR144750
R111	680k	FCXR056800
R112	MF24k0	FCXR142430
R113	MF1k21	FCXR131210
R114	MF487 Ohms	FCXR124870
R115	MF191 Ohms	FCXR121910
R116	MF487 Ohms	FCXR124870
R117	MF191 Ohms	FCXR121910
R118	MF1k21	FCXR131210
R119	390 Ohms / 1/2W	FCRF23390
R120	Adjustable 500 Ohms	FCRJP35000
R121	1k5	FCXR031500
R122	1k5	FCXR031500
R123	1k5/ 1/2W	FCRC241500

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM360E	DRW.Nº 33.0272 and 275PL	REPLACES:
DATE: 10.02.98	SHEET 3 OF 4	REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
R124	Adjustable 5k	FCRJP44700
R125	680 Ohms / 1/2W	FCRF236800
R126	10 Ohms	FCXR011000
R127	10 Ohms	FCXR011000
R128	NF68 Ohms / 1W	FCRF426800
R129	NF68 Ohms / 1W	FCRF426800
R130	Not assembled	
R131	NF330 Ohms	FCRF233300
R132	Not assembled	
R133	Not assembled	
R134	NF330 Ohms	FCRF233300
R135	Not assembled	
R136	Not assembled	
R137	NF330 Ohms	FCRF233300
R138	Not assembled	
R139	Not assembled	
R140	NF330 Ohms	FCRF233300
R141	Not assembled	
R142	Not assembled	
R143	W0.22 Ohms / 5W	FCRY000100
R144	Not assembled	
R145	Not assembled	
R146	W0.22 Ohms / 5W	FCRY000100
R147	Not assembled	
R148	Not assembled	
R149	W0.22 Ohms / 5W	FCRY000100
R150	Not assembled	
R151	Not assembled	
R152	W0.22 Ohms / 5W	FCRY000100
R153	Not assembled	
R154	Not assembled	
R155	Not assembled	
R156	Not assembled	
R157	Not assembled	
R158	Not assembled	
R159	Not assembled	
R160	Not assembled	
R161	Not assembled	
R162	2k2	FCXR032200
R163	10k	FCXR041000
R164	10k	FCXR041000
R165	2k2	FCXR032200
R166	33k	FCXR043300
R167	33k	FCXR043300
R168	MF215 Ohms	FCXR122150
R169	MF215 Ohms	FCXR122150
R170	2k2	FCXR032200
R171	10k	FCXR041000
R172	10k	FCXR041000
R173	2k2	FCXR032200
R174	33k	FCXR043300
R175	33k	FCXR043300
R176	MF487 Ohms	FCXR124870
R177	MF487 Ohms	FCXR124870
R178	MF205 Ohms	FCXR122050
R179	MF205 Ohms	FCXR122050
R180	MF205 Ohms	FCXR122050
R181	MF205 Ohms	FCXR122050

PARTS LIST:	PRINTED CIRCUIT 11.0651	REV:
MODEL: PAM360E	DRW.Nº 33.0272 and 275PL	REPLACES:
DATE: 10.02.98	SHEET 4 OF 4	REPLACED BY:

OLD VERSION

REFERENCE	VALUE	CODE
R182	10 Ohms / 2W	FCRC521000
R183	W6.8 Ohms / 5W	FCRY000200
R184	NF2.2 Ohms / 2W	FCRC512200
R185	75 Ohms	FCXR017500
R186	75 Ohms	FCXR017500
TP1	Test terminal	FCTERMSOL0
TP2	Test terminal	FCTERMSOL0
TS101	BLACK	WIRE 6
TS102/103/104/105	WHITE/YELLOW/BROWN/BLACK	WIRE 1